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75 PLASMA PHYSICS **2228**
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics.* For space plasmas see *90 Astrophysics.*

76 SOLID-STATE PHYSICS **2231**
Includes superconductivity.
For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

77 THERMODYNAMICS AND STATISTICAL PHYSICS **N.A.**
Includes quantum mechanics; and Bose and Fermi statistics.
For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law and political science; and urban technology and transportation.

80 SOCIAL SCIENCES (GENERAL) **2244**
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT **2246**
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE **2247**
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS **N.A.**
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE **2248**
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION **2249**
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) **N.A.**

89 ASTRONOMY **2250**
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS **N.A.**
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION **2250**
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS **2251**
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION **2252**
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL **2252**

Note: N.A. means that no abstracts were assigned to this category for this issue.

SUBJECT INDEX **I-1**
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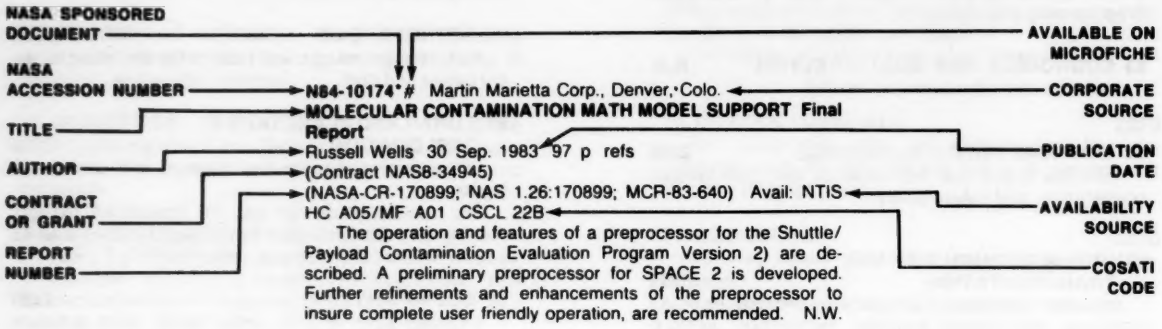
REPORT / ACCESSION NUMBER INDEX **I-77**

TYPICAL CITATION AND ABSTRACT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N84-10174* # Martin Marietta Corp., Denver, Colo.
MOLECULAR CONTAMINATION MATH MODEL SUPPORT Final Report
Russell Wells 30 Sep. 1983 97 p refs
(Contract NAS8-34945)
(NASA-CR-170899; NAS 1.26:170899; MCR-83-640) Avail: NTIS HC A05/MF A01 CSCL 22B
The operation and features of a preprocessor for the Shuttle/ Payload Contamination Evaluation Program Version 2) are described. A preliminary preprocessor for SPACE 2 is developed. Further refinements and enhancements of the preprocessor to insure complete user friendly operation, are recommended. N.W.

VOLUME 22 NUMBER 14/JULY 23, 1984

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N84-23551# Joint Publications Research Service, Arlington, Va.
USSR REPORT: TRANSPORTATION
24 Feb. 1984 64 p Transl. into ENGLISH from various Russian articles
(JPRS-UTR-84-004) Avail: NTIS HC A04/MF A01

Articles addressing various topics in civil aviation, motor vehicles and highways, maritime and river fleets, and ports and transshipment centers are presented. Several technical briefs are also included for each of the study areas. For individual titles, see N84-23552 through N84-23554.

N84-23552# Joint Publications Research Service, Arlington, Va.
MINISTRY OFFICIAL ON IMPROVING ALL-WEATHER AVIATION CAPABILITIES **c04**
T. Anodina *In its* USSR Rept.: Transportation (JPRS-UTR-84-004) 24 Feb. 1984 p 1-5 Transl. into ENGLISH from Grazhdanskaya Aviats. (Moscow), no. 12, Dec. 1983 p 14-15 (For primary document see N84-23551 14-01)
Avail: NTIS HC A04/MF A01

An overview of research aimed at improving all-weather aviation capabilities is presented. Glideslope radio beacons, airport lighting equipment, on-board equipment, metric and centrimetric-wave landing systems, and takeoff-run monitoring are discussed. Problems associated with the integration of new systems are addressed along with the economic and safety issues. M.G.

N84-23553# Joint Publications Research Service, Arlington, Va.
LEGAL EXPERT EXPOUNDS ON NEW CIVIL AIR CODE **c84**
N. Vasilyev *In its* USSR Rept.: Transportation (JPRS-UTR-84-004) 24 Feb. 1984 p 6-11 Transl. into ENGLISH from Grazhdanskaya Aviats. (Moscow), no. 10, Oct. 1983 p 18-19 (For primary document see N84-23551 14-01)
Avail: NTIS HC A04/MF A01

Provisions of the USSR Civil Air Code of 1983 are examined in light of the previous code. Changes in the use of airspace which led to the adoption of the new code are discussed. Important changes in terminology are reviewed. M.G.

N84-23554# Joint Publications Research Service, Arlington, Va.
ILYUSHIN DESIGN BUREAU ACHIEVEMENTS PROFILED
G. V. Novozhilov *In its* USSR Rept.: Transportation (JPRS-UTR-84-004) 24 Feb. 1984 p 12-17 Transl. into ENGLISH from Grazhdanskaya Aviats. (Moscow), no. 10, Oct. 1983 p 5-7 (For primary document see N84-23551 14-01)
Avail: NTIS HC A04/MF A01

A historical review of the achievements of a Soviet design collective is presented. Development of the DB-3, Il-2, the Il-18 turboprop, the reverse thrust Il-62, the Il-76T transport, and others is addressed. M.G.

N84-23555# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Metallische Werkstoffe.
DEVELOPMENT AND DEMONSTRATION OF ECONOMIC PRODUCTION SYSTEMS IN AIRFRAME CONSTRUCTION. PART 2: TECHNOLOGICAL PHASE. PART 6: REVIEW Final Report, 1 Dec. 1980 - 30 Jun. 1983 [ENTWICKLUNG UND NACHWEIS WIRTSCHAFLICHER FERTIGUNGSVERFAHREN IM FLUGZEUGZELLENBAU. 2: TECHNOLOGIEPHASE. 6: REVIEW]
Nov. 1983 152 p In GERMAN
(Contract RUE-T/R-421/A-0032/A-4468)
Avail: NTIS HC A08/MF A01

The alpha jet pylon; the MRCA aircraft test facilities; statistical and vibratory fatigue limit characteristics of aluminum cast alloys; and compressed titanium fine cast components are treated. Riveting; welding of aluminum cast alloy A357 components; superplastic transformation and diffusion welding of titanium alloys, and aluminum precision forging components are discussed. For individual titles, see N84-23556 through N84-23563.

N84-23556# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Metallische Werkstoffe.
ALPHA JET PYLON [ALPHA-JET PYLON]
K. F. Sahm *In its* Develop. and Demonstration of Econ. Production Systems in Airframe Construct., Part 2, Part 6 Nov. 1983 p 9-43 In GERMAN (For primary document see N84-23555 14-01)
Avail: NTIS HC A08/MF A01

The Alpha Jet pylon was investigated in order to check the possibilities of cast components of design and manufacture in airframe construction. Sample tests, evaluation, vibratory fatigue limit, finishing, and statistical component tests were performed. Sample tests of cast components in Precial-casting show that the high fatigue limit and dimensional accuracy requirements are also obtained for large and complex components. A weight reduction of 33% compared to the conventional methods, and a tensile strength of 350 N/sqmm are achieved. The results of testing of sand-cast components show that dimensional stability and tensile strength pose no problems. A weight reduction of 18% and a tensile strength of 360 N/sqmm are obtained. Both cast versions allow a clearly better economic production. Author (ESA)

N84-23557# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Metallische Werkstoffe.
MRCA RUN-IN FLOORS [MRCA-EINLAUFBODEN]
H. Fromeyer *In its* Develop. and Demonstration of Econ. Production Systems in Airframe Construct., Part 2, Part 6 Nov. 1983 p 44-59 In GERMAN (For primary document see N84-23555 14-01)
Avail: NTIS HC A08/MF A01

Precial cast and low pressure sand-cast run-in floors made of the aluminum cast alloy A357 T6 were manufactured for the MRCA aircraft. A cost reduction of 45% for Precial-cast and 60% for low pressure sand-cast is obtained as compared to the conventional method. Optimization of dimensional and strength characteristics show positive results. Author (ESA)

N84-23558# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Metallische Werkstoffe.

STATISTICAL AND VIBRATORY FATIGUE LIMIT CHARACTERISTICS OF ALUMINUM CAST ALLOYS [STATISCHE UND SCHWINGFESTIGKEITSKENNWERTE FUER AI-GYSSLEGIERUNGEN] c39

H. Frommeyer *In its* Develop. and Demonstration of Econ. Production Systems in Airframe Construct., Part 2, Part 6 Nov. 1983 p 60-80 In GERMAN (For primary document see N84-23555 14-01)

Avail: NTIS HC A08/MF A01

Statistical, fracture mechanics, dynamic, and crack propagation characteristics were determined for high strength aluminum alloy A357 T6 airframe components manufactured with the fine cast and Precial-cast Avior procedures. Statistical tests show that mechanical characteristics are better than the required values. Tensile test samples were statically loaded till fracture. For the cast method the required fracture toughness is correctly chosen; the yield point value can be increased. For the Precial-cast method the required values can be considerably higher. Author (ESA)

N84-23559# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Metallische Werkstoffe.

ADDITIONALLY COMPRESSED TITANIUM FINE CAST COMPONENTS [NACHVERDICHTETE TITAN - FEINGUSSSTELLE] c26

K. Blomeier *In its* Develop. and Demonstration of Econ. Production Systems in Airframe Construct., Part 2, Part 6 Nov. 1983 p 81-83 In GERMAN (For primary document see N84-23555 14-01)

Avail: NTIS HC A08/MF A01

The effect of hot isostatic compression on the vibratory fatigue limit behavior of titanium fine cast components was investigated. Results show that the use of titanium casts in aircraft construction is required for fatigue limit and cost reduction reasons. Author (ESA)

N84-23560# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Metallische Werkstoffe.

ECONOMIC RIVETING: DIFFERENT BORE QUALITIES, FITTINGS, CONNECTION ELEMENTS [WIRTSCHAFTLICHES NIETEN: UNTERSCHIEDLICHE BOHRUNGSQUELITATETEN, PASSUNGEN, VERBINDUNGSELEMENTE] c37

K. Hoffer *In its* Develop. and Demonstration of Econ. Production Systems in Airframe Construct., Part 2, Part 6 Nov. 1983 p 84-86 In GERMAN (For primary document see N84-23555 14-01)

Avail: NTIS HC A08/MF A01

Riveted test rods made of the aluminum cast alloy A357 T6 were tested under single flight load FALSTAFF in order to investigate the influence of the connecting element assembling the rod and of the drilling procedure. Comparison between the connecting elements of the types Hi-Lok (screw rivet) and Lockbolt (fitting rivet) shows no considerable difference. Taper-Lok screw rivets and Hi-Tigue screw rivets have a slightly better vibratory fatigue limit behavior than Hi-Lok rivets. As compared to the riveted AGARD test rods made of the aluminum wrought alloy 3.4364 T 7357, the vibratory fatigue limit of the aluminum cast alloy is lower in the domain between 20,000 and 50,000 simulated flights. From 60,000 flights on it is equal or better. Author (ESA)

N84-23561# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Metallishe Werkstoffe.

WELDING OF COMPONENTS MADE OF THE ALUMINUM CAST ALLOY A357 [SCHWEISSEN VON BAUTEILEN AUS DER AI-GUSSLEGIERUNG A357] c37

G. Meye *In its* Develop. and Demonstration of Econ. Production Systems in Airframe Construct., Part 2, Part 6 Nov. 1983 p 87-97 In GERMAN (For primary document see N84-23555 14-01)

Avail: NTIS HC A08/MF A01

The fatigue resistance of welded A357 aluminum cast alloy samples was tested and the welding of airframe components was investigated. Electron beam and tungsten-inert gas welding were used. The effects of heat treatment were also investigated. The tests shows that the results on probes can be extrapolated to welded components, and that large scale economic production in airframe construction is possible. Author (ESA)

N84-23562# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Metallische Werkstoffe.

SUPERPLASTIC TRANSFORMATION AND DIFFUSION WELDING OF TITANIUM ALLOYS [SUPERPLASTISCHES UMFORMEN DIFFUSIONSSCHWEISSEN VON TI-LEGIERUNGE] c37

W. Beck *In its* Develop. and Demonstration of Econ. Production Systems in Airframe Construct., Part 2, Part 6 Nov. 1983 p 98-123 In GERMAN (For primary document see N84-23555 14-01)

Avail: NTIS HC A08/MF A01

Propeller ribs were manufactured in order to study construction details, manufacturing parameters and cost data of the superplastic forming/diffusion ion bonding (SPF/DB) technology. The use of titanium is justified by the presence of high thermal and mechanical loads. The test results demonstrate that the SPF construction technique is suitable for three-dimensional structures in titanium alloys, and that the combination SPF/DB technique is suitable for flat components. The required weight and cost reductions can be realized by the SPF/DB combination for three-dimensional airframe components. Author (ESA)

N84-23563# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Metallische Werkstoffe.

ALUMINUM PRECISION FORGING COMPONENTS [AI-GENAUSCHMIEDETEILE] c31

W. Zink *In its* Develop. and Demonstration of Econ. Production Systems in Aircraft Construct., Part 2, Part 6 Nov. 1983 p 124-147 In GERMAN (For primary document see N84-23555 14-01)

Avail: NTIS HC A08/MF A01

Economic and production characteristics of precision forged aluminum alloy fighter aircraft components were investigated, using MRCA aircraft components. Test results show that large precision forging components (projected surface > 1000 sq cm) can be technically and economically produced. Author (ESA)

N84-23564# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

WIND TUNNELS AND TESTING TECHNIQUES

Loughton, England Feb. 1984 514 p refs In ENGLISH and FRENCH Symp. held at Cesme, Turkey, 26-29 Sep. 1983 (AGARD-CP-348; ISBN-92-835-0348-1) Avail: NTIS HC A22/MF A01

The design and operation of cryogenic wind tunnels and transonic facilities are discussed as well as associated fluid motion problems. Testing techniques are considered with emphasis on support interference, inlet/engine/ afterbodies, store separation, half models, aeroacoustic measurements, and wind tunnel-flight data comparisons. For individual titles, see N84-23565 through N84-23601.

N84-23565*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

OPERATIONAL EXPERIENCE WITH THE NATIONAL TRANSONIC FACILITY c09

L. W. McKinney *In* Agard Wind Tunnels and Testing Tech. Feb. 1984 8 p refs (For primary document see N84-23564 14-01)

Avail: NTIS HC A22/MF A01 CSCL 01B

Construction of the National Transonic Facility was completed in September 1982. The checkout of all systems required about one year. The facility operated to the design point of 120 million Reynolds number based on a 0.25 meter chord at a Mach number of 1.0. Performance of all systems was basically as expected. Setup for the detailed aerodynamic calibration begins late in 1983, and the calibration is expected to be complete by the last quarter of 1984. Author

N84-23566# National Aerospace Lab., Amsterdam (Netherlands).

THE EUROPEAN TRANSONIC WINDTUNNEL (ETW) Status Report c09

R. J. North, F. Maurer, J. Prieur, J. A. Schimanski, and J. A. Tizard *In* Agard Wind Tunnels and Testing Tech. Feb. 1984 12 p refs (For primary document see N84-23564 14-01)

Avail: NTIS HC A22/MF A01

The status of the preliminary design phase of the European Transonic Windtunnel project is described. The latest version of the proposed tunnel is given together with some details of its estimated performance. Some features of the tunnel which were revised following the first preliminary design proposals are discussed and the results of an investigation into the expected future use of the tunnel are summarized. An aerodynamic circuit test-rig is described along with some of the results obtained. Information on the pilot tunnel is included as well as reference to the supporting program on cryogenic technology. Author

N84-23567# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France). Dept. d'Aerothermodynamique.

THE T2 CRYOGENIC WIND TUNNEL WITH SELF-ADAPTABLE WALLS AT ONERA/CERT [LA SOUFFLERIE CRYOGENIQUE A PAROIS AUTO-ADAPTABLES T2 DE LONERA/CERT] c09

A. Mignosi and J. B. Dor *In* Agard Wind Tunnels and Testing Tech. Feb. 1984 12 p refs In FRENCH; ENGLISH summary (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

The transonic induction driven wind-tunnel T2 at the ONERA Toulouse Research Center is equipped with a 0.4 x 0.4 sq m test section, and is a pressurized closed circuit wind-tunnel, operating at ambient temperature with runs of 30 to 60 seconds. The wind-tunnel was adapted for cryogenic operation using liquid nitrogen as a coolant and an internal thermal insulation. The main characteristics of the wind-tunnel at low temperature and of the constituents used to perform airfoil tests with adaptive walls are described. The flow qualities are analyzed through an evaluation of the thermal gradients, pressure and thermal fluctuations studies, and the operating limit at very low temperature. The effects of various parameters able to influence test results are examined, such as boundary layer transition and differences between wall temperature and adiabatic wall recovery temperature. A.R.H.

N84-23568# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany).

THE CRYOGENIC WIND TUNNEL COLOGNE c09

G. Viehweger *In* Agard Wind Tunnels and Testing Tech. Feb. 1984 8 p (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

The modification of a low-speed wind tunnel to cryogenic operation is discussed. The tunnel with a test section of 2.4 m x 2.4 m should be operational in the middle of 1984. The technical concept of the tunnel is examined and some of the most important components are described. Author

N84-23569# Institut Aerotechnique de Saint-Cyr, Saint-Cyr-l'Ecole (France).

PRODUCING A CRYOGENIC GUST IN AN EIFFEL TYPE ATMOSPHERIC WIND TUNNEL WITH SHORT GUST [PRODUCTION DUNE RAFALE CRYOGENIQUE DANS UNE SOUFFLERIE DE TYPE EIFFEL ATMOSPHERIQUE A RAFALE COURTE] c09

Dominique Chauvet and Christian Dujarric (Serice Technique des Programmes Aeronautiques, Paris) *In* Agard Wind Tunnels and Testing Tech. Feb. 1984 17 p refs In FRENCH (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

Demonstrations of the feasibility of an Eiffel-type cryogenic atmospheric wind tunnel with short gusts and of the economy of operation of such a concept requires prior resolution of certain specific technical problems found in this type wind tunnel. The technique for generating cryogenic gaseous flow by atomizing liquid nitrogen in air at the level of the plenum chamber is described as well as the chronological feeding out of a cryogenic gust. Theoretical and experimental studies are developed for optimizing the evaporation of liquid nitrogen in the plenum chamber of a wind tunnel. The results of measuring the grain size of drops of liquid nitrogen are compared with a computation model which correctly represents the real behavior of the aerosol.
Transl. by A.R.H.

N84-23570# Calspan Field Services, Inc., Arnold Air Force Station, Tenn. Propulsion Wind Tunnel Facility.

A REVIEW AND AN UPDATE OF THE FDP SPECIALISTS MEETING (LONDON) ON WALL INTERFERENCE IN WIND TUNNELS c02

Travis W. Binion, Jr. and Edward M. Kraft *In* Agard Wind Tunnels and Testing Tech. Feb. 1984 12 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

The work reported at the Fluid Dynamics Prediction London Specialists meeting on wall interference in wind tunnels is reviewed. While there are many outstanding issues still to be resolved, a final solution to the wind tunnel interference problem does appear achievable. Wall interference research has taken on renewed interest in recent years pushed by more stingent accuracy requirements for vehicle performance predictions. The reseach is directed toward increased prediction accuracy, particularly for ventilated tunnels operating at transonic conditions, development of interference assessment techniques from model and/or tunnel boundary measurement and interference avoidance via various adaptive wall schemes. In addition, since wall interference cannot be separated readily from the effects of other inherent tunnel and test properties such as wall boundary layers, noise, turbulence, model fidelity, etc., some research is being conducted to quantify the effect of other phenomena in order to verify the wall interference effects once they are identified. R.J.F.

N84-23571# Technische Univ., Berlin (West Germany). Inst. fuer Luft- und Raumfahrt.

A SHORT NOTE ON RECENT ADVANCES IN THE ADAPTIVE WALL TECHNIQUE FOR 3D-MODEL TESTS AT THE TU-BERLIN c02

U. Ganzer *In* Agard Wind Tunnels and Testing Tech. Feb. 1984 2 p ref Sponsored in part by the German Minister of Research and Technology (BMFT) and The German Research Association (DFG) (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

In the test section with eight flexible walls the first successful wall adaptations were carried out for a lifting wing body configuration at transonic speeds. The adaptive wall technique is an iterative procedure in which the boundary conditions at the test section walls are adjusted to the conditions of an unlimited flow field. In the TU-Berlin test section eight flexible walls are individually shaped such that a (nearly) streamlined three dimensional wall configuration is formed. The starting configuration was the aerodynamically plane wall, i.e. the one which leads to constant Mach number along the empty test section (without model but with quadrant). The model in the test section creates a pressure distribution along each wall different from C sub P = 0. The wall shape can be used as a boundary condition for an external flow field calculation e.g. with a three dimensional panel method. The pressure distribution calculated this way can then be compared with the measured pressure distribution. Only if the measured and calculated pressures are the same the test section flow may be considered free of wall interference. The test results given demonstrate in principle the feasibility of the adaptive wall technique for three dimensional model tests. R.J.F.

N84-23572# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).

TURBULENT DIFFUSER FLOW STUDIES RELATED TO THE DESIGN OF THE ETW DIFFUSER c34

H. W. Stock *In* Agard Wind Tunnels and Testing Tech. Feb. 1984 9 p refs Sponsored in part by Technical Group ETW, Amsterdam (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

A computational method based on the boundary layer concept is used for calculating turbulent flows in diffusers with circular cross sections. That newly developed method is shown to produce reasonable agreement with a critical experiment for which existing methods fail. In a parametric study, varying Reynolds- and Mach number for different diffuser inlet conditions, turbulent flows in the diffuser are considered to describe the efficiency of the diffuser

and the danger of flow separation. The Reynolds number range investigated was such, to cover flow situations from the 1:7.2 scale test diffuser under non cryogenic conditions to the full scale diffuser applying cryogenic conditions. In supplement some geometry modifications are studied to see whether the efficiency of the diffuser can possibly be augmented. Author

N84-23573# Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.
DISTURBANCES FROM VENTILATED TUNNEL WALLS IN AEROFOIL TESTING **c02**
M. C. P. Firmin and P. H. Cook *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 15 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

Evidence is presented which indicates that inflow through the slots of a slotted walled wind tunnel, when testing an aerofoil at conditions similar to those found in flight on wings, can penetrate into the tunnel flow to an extent which makes the determination of suitable homogeneous boundary conditions very difficult. The measurements show that the flow field generated by a lifting aerofoil causes low energy air from the plenum chamber to be drawn into the wind tunnel through the slots in the region of the upper surface of the aerofoil and that this air spreads into the working section downstream of the aerofoil. Suggestions are made for avoiding the difficulty in any future design of wind tunnel. Author

N84-23574# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
GROUND/FLIGHT TEST TECHNIQUES AND CORRELATION **c05**
Ph. Poisson-Quinton *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 14 p refs In FRENCH; ENGLISH summary (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

Wind-tunnel usefulness and shortcomings during the development of a new Aircraft Project are discussed, taking into account progress on wind tunnel validity and cost/effectiveness, on the increasing role of the computer in the loop, and on the competition between computational fluid dynamics and wind-tunnel approaches for aerodynamic characteristics prediction. Lastly, the new role of the wind-tunnel in the Aircraft is advocated. R.J.F.

N84-23575*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
HIGH REYNOLDS NUMBER TESTS OF THE CAST 10-2/DOA2 TRANSONIC AIRFOIL AT AMBIENT AND CRYOGENIC TEMPERATURE CONDITIONS **c02**
E. Stanewsky (DFVLR, Goettingen, West Germany), F. Demurie (DFVLR, Goettingen, West Germany), E. J. Ray, and C. B. Johnson *In* Agard Wind Tunnels and Testing Tech. Feb. 1984 13 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01 CSCL 01A

The transonic airfoil CAST 10-2/DOA2 was investigated in several major transonic wind tunnels at Reynolds numbers ranging from Re=1 million six hundred thousand to forty five million at ambient and cryogenic temperature conditions. The main objective was to study the degree and extent of the effects of Reynolds on both the airfoil aerodynamic characteristics and the interference effects of various model-wind-tunnel systems. the initial analysis of the 10-2 airfoil results revealed appreciable real Reynolds number effects on this airfoil and, moreover, showed that wall interference, can be significantly affected by changes in Reynolds number thus appearing as true Reynolds number effects. R.J.F.

N84-23576# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Berlin (West Germany). Abteilung Turbulenzforschung.
DEFINITION, SOURCES AND LOWEST POSSIBLE LEVELS OF WIND-TUNNEL TURBULENCE **c34**
Ulf Michel and Eberhard Froebel *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 12 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

Wind tunnel turbulence is defined to include the fluctuations of all flow quantities in an empty tunnel test section. It can be separated into three modes, vorticity, entropy, and pressure. The pressure model is discussed in more detail. It is shown that contributions from the free shear layers of open test sections or the boundary layers of closed test sections are accompanied by much higher velocity fluctuations than plane sound waves. The lowest possible velocity fluctuation level in an open test section is determined by the pressure field generated by the free shear layer. The German-Dutch Wind Tunnel (DNW) is shown to reach this level. It is assumed that the lowest possible turbulence level in a closed test section is determined by the pressure field that is generated by the boundary layers in the test section. A spectral energy distribution and a Reynolds number scaling law for this contribution are derived. Author

N84-23577*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AN EVALUATION OF FACTORS AFFECTING THE FLOW QUALITY IN WIND TUNNELS **c34**
F. K. Owen (Complere Inc., Palo Alto, Calif.), P. C. Stainback, and W. D. Harvey *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 22 p refs (For primary document see N84-23564 14-01) (Contracts NAS1-16643; NAS2-10859; NAS2-11080)
Avail: NTIS HC A22/MF A01 CSCL 20D

Tests were conducted in a number of NASA wind tunnels to measure disturbance levels and spectra in their respective settling chambers, test sections, and diffusers to determine the sources of these disturbances. Results indicate that properly designed and located second minimum in transonic tunnels prevent fluctuation originating at struts and in diffusers from propagating upstream into the test section. The installation in or upstream of the settling chamber of carefully selected screens, honeycomb, and acoustic baffles could further reduce test section turbulence levels and scales without significant pressure losses. The performance of these modifications is strongly influenced by tunnel geometry and their influence on the mean flow around the circuit. Author

N84-23578# Dornier-Werke G.m.b.H., Munich (West Germany). Theoretical Aerodynamics.
PREDICTION OF CONDENSATION ONSET AND GROWTH IN THE EUROPEAN TRANSONIC WIND TUNNEL (ETW) **c34**
Bernhard Wagner and Michael Doker (DFVLR, Goettingen, West Germany) *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 11 p refs Sponsored in part by the German Ministry of Research and Technology, and by the Technical Group ETW, Amsterdam (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

Experimental and theoretical investigations were carried out to allow reliable prediction of condensation onset and growth in cryogenic wind tunnels. The idea of streamline duplication was used in the experiments in order to simulate European Transonic Wind Tunnel (ETW) streamlines in an experimental facility of small cross section but with real ETW length scale. Classical nucleation theory was used for developing computer programs which can predict condensation processes in one dimensional flow including real gas effects. Experiments and calculations show satisfactory agreement and confirm the possibility of an operating range extension for the ETW. The results provide some new data with respect to those cases where the condensate consists of solid particles. Author

N84-23579# Douglas Aircraft Co., Inc., Long Beach, Calif. Aerodynamics Subdiv.
NONADIABATIC MODEL WALL EFFECTS ON TRANSONIC AIRFOIL PERFORMANCE IN A CRYOGENIC WIND TUNNEL **c34**
F. T. Lynch, M. F. Fancher, D. R. Patel, and G. R. Inger (West Virginia Univ., Morgantown) *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 11 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

The need to match the aircraft surface thermal conditions that exist at in-flight conditions when testing models in a cryogenic wind tunnel is addressed. Effects of non-representative heat transfer are reviewed for such basic viscous characteristics as the effect on boundary-layer transition location, the effects on turbulent boundary-layer integral parameters and skin friction, the effect on the transonic turbulent boundary-layer/shock-wave interaction, and the effects on separation onset and the extent of separated flow regions. A complementary experimental and computational investigation was conducted in order to help quantify the impact that nonadiabatic model wall conditions would have on the measured aerodynamic characteristics of transport (and other) airplane configurations tested in a cryogenic wind tunnel, and to help establish the allowable deviation from adiabatic wall conditions that can be tolerated if reliable results are to be obtained. Test results are presented which illustrate the large impact of moderate amounts of heat transfer on the lift and drag characteristics for both free-transition flow in the absence of any shock waves, and for typical cruise conditions with moderate strength shocks on the airfoil. In addition, test results are shown which illustrate a very large effect of heat transfer on buffer onset conditions and conditions near maximum lift. M.G.

N84-23580# National Aeronautical Establishment, Ottawa (Ontario).
PREDICTION OF RESONANCE FREQUENCIES FOR VENTILATED WALL WIND TUNNELS **c71**
M. Mokry *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 10 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

Based on the reflection and refraction of plane acoustic waves at an interface between the moving stream and the stagnant plenum air, a simple theory is developed for the prediction of transverse resonance in the two-dimensional test section with ventilated walls. The intensity and the frequency of resonance are determined from the modulus and the argument of the wall reflection coefficient respectively. In contrast to the eigenvalue method, the present technique is capable of predicting partial resonance, occurring in perforated walls and also in slotted walls at Mach numbers below 0.6.18, for which the resonant waves are partly reflected and partly transmitted at the wall. The reverse transmission of waves from the plenum into the test section is found to be inconsistent with the postulated resonance condition. M.G.

N84-23581# Lockheed Missiles and Space Co., Sunnyvale, Calif.
PRACTICAL SOLUTIONS TO SIMULATION DIFFICULTIES IN SUBSCALE WIND TUNNEL TESTS **c02**
L. E. Ericsson and J. P. Reding *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 12 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

Reynolds number scaling and support interference are the two main problems encountered in wind tunnel tests with subscale models. In the past, when the designer was striving to maintain attached flow over the vehicle, neither problem was very difficult to solve. The use of boundary layer trips often could solve the scaling problem and only the clumsiest of model support design would cause any interference beyond the easily corrected base drag effect. However, when the aerodynamics are dominated by separated flow effects, which often is the case for present day high performance aircraft and missiles, both problems become formidable. Practical means through which the test engineer can resolve these difficulties are described. Author

N84-23582# National Aeronautical Establishment, Ottawa (Ontario). Unsteady Aerodynamics Lab.
RECENT DEVELOPMENTS AND FUTURE DIRECTIONS IN DYNAMIC STABILITY RESEARCH AT NAE, OTTAWA **c02**
K. J. Orlik-Rueckemann, E. S. Hanff, and M. E. Beyers *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 6 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

A review is presented of recent developments in the field of dynamic stability research in the Unsteady Aerodynamics Laboratory of the NAE. The developments include design and construction of several new oscillatory apparatuses, conceptual studies of some additional ones and thoughts about the future direction of the activities in this field. A method to account for sting oscillation effects on direct derivatives measured in a pitch oscillation experiment is briefly described, and some representative oscillatory results recently obtained on the so called Standard Dynamics Model are discussed. Author

N84-23583# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abt. Technische Akustik.
PROPELLER AND ROTOR NOISE TESTING IN AEROACOUSTIC WIND TUNNELS **c71**
H. H. Heller, W. R. Splettstoesser, R. F. Neubauer, F. R. Grosche, M. K. Kallergis, and K. J. Schultz *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 18 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

The availability of newly constructed low-noise aeroacoustic facilities - such as the German-Dutch-Windtunnel/DNW and the French CEPRA 19 Anechoic Open Jet Windtunnel - provides excellent experimental possibilities for conducting high-quality acoustic source-studies on aerospace-vehicle noise generators. This paper discusses recent and ongoing model-scale research on basic phenomena and applied problems pertaining to the generation and radiation of propeller and helicopter rotor noise. The importance and potential of aeroacoustic wind tunnel experiments in special facilities will be stressed, and illustrated mostly by examples of DFVLR and US-Army/DFVLR research projects. Emphasis is also put on the fruitful interrelationship of model-, wind-tunnel and full-scale flight testing. Author

N84-23584# Middle East Technical Univ., Ankara (Turkey). Dept. of Mechanical Engineering.
AEROACOUSTIC NOISE MEASUREMENTS IN WIND TUNNEL **c71**
H. Nafiz Alemdaroglu *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 14 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

The paper describes the general characteristics of the lowspeed Acoustic Research Wind Tunnel constructed in the Aerodynamics Laboratory of E.N.S.M.A (poitiers/France) and presents the results of the preliminary experiments conducted in this wind tunnel. The wind tunnel is of open test section, open circuit and blower type. It has a test section of 30x30 sq cm and a mean velocity of 42 m/s. Aerodynamic measurements revealed a maximum turbulence intensity of less than 1%. The open test section is completely enclosed within a acoustically lined semi-anechoic chamber of dimensions 3.3x4/2.8 sq cm. Acoustic calibration of the wind tunnel is done by using both white noise and pure tone noise sources and it was observed that the tunnel can be considered to be anechoic above 100 Hz for white noise tests. Preliminary measurements of aerodynamic noise are performed by using both smooth and artificially roughened circular cylinders placed in the open test section of the wind tunnel. An aeroacoustic coherence function is deviced in order to classify the subsonic flow at moderate Reynolds numbers 5.05x10 to the 4th power < Re sub d around a circular cylinder in its different flow regimes; subcritical, transcritical and supercritical. The method uses simultaneous measurements of the power spectra of the far field acoustic pressure and of the turbulent longitudinal velocity fluctuations in the wake of the cylinder as well as their cross spectra density functions CSD and especially the coherence function between the two signals. The values of the coherent function corresponding to the critical Strouhal frequencies are intense in the subcritical regime, decrease sharply in the transcritical domain and then increase and stabilize in the supercritical regime. Author

N84-23585# Aeronautica Macchi S. p. A., Varese (Italy).
USE OF A SMALL SCALE WIND TUNNEL AND MODEL SHOP

AT AERONAUTICA MACCHI AS AN INDUSTRIAL TOOL c09
R. Marazzi, D. Malara, M. Lucchesini, S. Comoretto, and F. Pacori *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 15 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

The paper describes some facilities and capabilities which are currently available at the Aerodynamic Test Department of Aeronautica Macchi. Special wind tunnel testing techniques allow the use of a small scale wind tunnel to obtain useful data for the development of aircraft configurations; model work-shop capabilities permit the manufacture of specialized wind tunnel models for detailed analysis of problem areas. The topics covered are: (1) updating of the rotary balance facility for the measurement of dynamic derivatives due to roll in the full range of model attitudes; (2) assessment of Reynolds number effects on high lift devices of modern design; (3) design and manufacture of an afterbody model; and (4) manufacture and testing of flutter models. B.W.

N84-23586# Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
FLUID DYNAMIC ASPECTS OF TURBINE ENGINE TESTING c07
James G. Mitchell *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 19 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

Turbine engine testing in ground test facilities cannot rely upon the simulation parameters that are common to aerodynamic testing in wind tunnels. The interfaces between the internal fluid dynamics of the engine and the external aerodynamics of the flight vehicle are sometimes simulated in wind tunnels and sometimes duplicated in engine test facilities. The choice is primarily dictated by test facility capability and finances available for test models. This paper will discuss some of the testing techniques which have been used and denote research efforts which are directed toward extension of test procedures and facility capability. In particular, applicable material from the recent AGARD Propulsion and Energetics Panel Symposium on Turbine Engine Testing will be summarized and amplified. Some emphasis will be placed upon airframe-inlet-engine testing and the development of testing capabilities for this purpose. Author

N84-23587# Societe Nationale Industrielle Aerospatiale, Toulouse (France). Div. Avions.
THE 310 AIRBUS TEST IN THE ONERA WIND TUNNEL: FLIGHT-WIND TUNNEL COMPARISON [AIRBUS A310 ESSAIS DANS LA SOUFFLERIE F1 DE L'ONERA COMPARAISON VOL-SOUFFLERIE] c65
M. Saiz and C. Quemard (ONERA, Paris) *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 23 p refs In FRENCH; ENGLISH summary (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

Methods used to obtain measurements on the 1/14 scale model of the A 310 in the F1 wind tunnel are described. The use of three types of mounts permitted a critical analysis of the results and assured their validity. Direct comparison of the measurements obtained with performances deduced from flight are remarkable.
Transl. by A.R.H.

N84-23588# National Aerospace Lab., Amsterdam (Netherlands).
HALF-MODEL TESTING IN THE NLR HIGH SPEED WIND TUNNEL HST: ITS TECHNIQUE AND APPLICATION c02
S. J. Boersen and A. Elsenaar *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 15 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

The half model test technique which is based on a systematic comparison of half model test results with the corresponding full model data was evaluated. It is shown that the most important problems with this technique originate from half model mounting and wall interference effects. The effects are determined empirically by use of the full model test results as a reference. It is shown that the pressure distribution on the wing and the off design boundaries are well represented in the half-model tests. Some typical applications of this technique, in which half model test results are used on a relative basis, are presented. E.A.K.

N84-23589# Calspan Field Services, Inc., Arnold Air Force Station, Tenn.
TEST TECHNIQUES FOR JET EFFECTS ON FIGHTER AIRCRAFT c05
Earl A. Price, Jr. and William L. Peters *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 17 p refs Sponsored by AEDC (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

Efforts to improve test techniques for jet effects on fighter type aircraft are described. Defining the levels of aerodynamic interference on aircraft afterbodies from three types of model support systems, a prediction technique for hot jet effects on afterbody drag, and a hot versus cold jet experiment on target type thrust reversers is summarized. Support system interference from a strut, sting, and wingtip support on the afterbody axial force of the same jet effects model are compared over the Mach number range from 0.6 to 1.5. A technique for predicting hot jet effects on afterbody drag from ambient temperature jet data is presented and evaluated at Mach numbers 0.6, 0.9, and 1.2 Two distinctly different flow regimes characterized by flow attached to or detached from the surface of the afterbody are shown. Significant differences were found in the conditions for flow attachment for the hot and cold jet flows. E.A.K.

N84-23590*# General Dynamics/Convair, San Diego, Calif.
DESIGN OF ADVANCED TECHNOLOGY MANEUVERING AIRCRAFT MODELS FOR THE NATIONAL TRANSONIC FACILITY c02
Stanley A. Griffin, A. A. McClain, and A. P. Madsen (General Dynamics, Fort Worth, Tex.) *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 15 p refs Sponsored by NASA. Langley Research Center (For primary document see N84-23564 14-09)
Avail: NTIS HC A22/MF A01 CSCL 01A

The need for a large High-Reynolds-Number Transonic Wind Tunnel which will provide a tool to study phenomena sensitive to Reynolds number is discussed. The National Transonic Facility (NTF), is in the calibration phase and the desired capability. Its usefulness, however, will be influenced by the ability of industry to develop model systems capable of withstanding the severe operating environment of the facility so necessary to achieve full scale Reynolds number, without degradation of accuracy, and at reasonable cost. The feasibility of designing models of advanced aerodynamic technology maneuvering aircraft and to achieve full scale Reynolds number for each configuration in the NTF are determined. It is concluded that the facility does not offer the potential for making tunnel to full scale data correlations for this type of aircraft configuration. E.A.K.

N84-23591# Aeritalia S.p.A., Torino (Italy). Gruppo Velivoli da Combattimento.
DESIGN OF A WIND TUNNEL AFTERBODY MODEL FOR THE DEVELOPMENT OF A TRANSONIC COMBAT AIRCRAFT c02
G. Bertolone and E. Farinazzo *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 15 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

A single engine combat aircraft, complete afterbody model was designed and tested in transonic wind tunnel for integration of the experimental results obtained from the unpowered models. The model was designed with potential capability to investigate the tailplane effectiveness and the effects of the secondary jet outlets, tail fairings, excrescences, and aerials. The general arrangement of the model are described. The necessity of an accurate sealing between the fixed and the weighed parts with the minimum mechanical interference to obtain reliable results in terms of afterbody drag is stressed. E.A.K.

N84-23592# Calspan Field Services, Inc., Arnold Air Force Station, Tenn.

TRANSONIC NOZZLE-AFTERBODY FLOW FIELD MEASUREMENTS USING A LASER DOPPLER VELOCIMETER c02
Fred L. Heltsley, Billy J. Walker (Army Missile Command, Redstone Arsenal, Ala.), and Robert H. Nichols (AEDC) *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 14 p refs Sponsored by AEDC (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

Nonintrusive laser Doppler velocimeter (LDV) flow field measurements for several nozzle afterbody configurations with cold nitrogen exhaust jets is described. Information about the test facility and instrumentation is presented. The test articles including one with a 15 deg. boattail afterbody and two having blunt bases are described. The two color, two component LDV optical package and data acquisition system used for the flow field measurements are discussed. The effects of particle dynamics upon the LDV measurement uncertainty are reviewed. Fluorescent seeding was used in conjunction with multiple techniques to gain a more complete understanding of the complex flow interactions in the model base region. Test results are summarized and selected data are presented. E.A.K.

N84-23593# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Hauptabt. Windkanaele.
THE NEW CALIBRATION TANK FOR ENGINE SIMULATORS AT DFVLR GOETTINGEN c09
B. Binder, E. Melzer, and R. Wulf *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 9 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

Interference effects between engine and airframe in wind tunnel tests the knowledge of the characteristics of model engines is necessary, especially if Turbine Powered Simulators (TPS) are used. The calibration tank which was built for the determination of TPS characteristics is described. Results of calibration measurements are presented for the six component balance and for the sonic nozzles to determine the mass flow. E.A.K.

N84-23594# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
NEW TPS CALIBRATION BENCH, AND EJECTOR TESTS c09
J. P. Becle, J. Coste, and J. Leynaert *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 12 p refs In FRENCH; ENGLISH summary (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

The new calibration bench for large turbopowered simulator (TPS), adapted to the airplane models in wind tunnels, is described. This bench uses an existing wind tunnel wall balance equipped with two compressed air supply devices, which is installed in a depressurized tank. The depressurization is obtained by the jet effect of the TPS acting as an ejector. Various types of ejectors were tested. The influence of the geometrical parameters is analyzed, and the problem of stable or instable conditions is presented. E.A.K.

N84-23595# Aircraft Research Association Ltd., Bedford (England).
RECENT DEVELOPMENTS IN STORE SEPARATION AND GRID SURVEY TECHNIQUES USING THE ARA TWO-STING RIG c02
M. E. Wood *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 13 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

The Two Sting Rig system provides captive trajectory and grid survey testing in the ARA 2.74 m x 2.44 m transonic wind tunnel, on models of the order of 10% scale. The system is used primarily in the captive trajectory mode to predict release characteristics for a wide range of stores/aircraft. The improvements to and developments of the system that have arisen from experiences gained during the last two years of its operational use are described. A brief description is given of the general arrangement of the rig. Improvements to performance, simulation capabilities and to wind tunnel productivity are described together with current design studies for new applications. An appraisal of the overall performance of the method against 3 other ground based techniques is used to illustrate its merits and defects, using results from recent Two Sting Rig wind tunnel tests and flight. M.A.C.

N84-23596# Fluidyne Engineering Corp., Minneapolis, Minn.
A SELF-CONTAINED CAPTIVE TRAJECTORY SYSTEM FOR A BLOWDOWN WIND TUNNEL c09
C. D. Christopherson, D. N. Kamis, D. M. Nelson, and R. D. Week *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 9 p (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

The trajectory of a store which is released from an aircraft can be determined by model tests using a six component sting balance to measure the aerodynamic forces and moments on the shell. A completely self contained captive trajectory system is described which is configured to provide maximum efficiency in the use of wind tunnel test time. There are three primary factors which contribute to achieving this goal: the self contained nature of the system, the use of high performance electrohydraulic servo positioning systems for all motions, the use of a modern high speed minicomputer and appropriately matched amplifier/multiplexer I/O equipment to acquire information, perform the mathematical manipulations required, and provide appropriate inputs to the servo systems. The system described is separated into four subsystems: the structural/mechanical system, the electrohydraulic positioning systems, the minicomputer based analyzer/programmer system, the software system. An overview of the wind tunnel circuit, a 4 ft by 4 ft (1.2 m x 1.2 m) trisonic blowdown configured to provide high quality by the use of a perforated sleeve valve flow control, perforated flow diffusers, acoustic baffles, a honeycomb, and screens, is given. M.A.C.

N84-23597# British Aerospace Aircraft Group, Brough (England).
THE ACCELERATED LIGHT MODEL TECHNIQUE OF STORE SEPARATION AS DEVELOPED AND USED AT BRITISH AEROSPACE, BROUGH c05
Robert E. Burns *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 12 p (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

The light model technique developments for use in the Brough High Speed Wind Tunnel, which succeeded in producing a reliable and practical method of virtually eliminating errors due to the usual compromises are examined. The theoretical concepts are described in detail, and results from a typical wind tunnel jettison test are presented. The method employed is light model scaling, with parent model acceleration to compensate for the gravitational deficiency inherent in this technique. A detailed analysis of residual errors in simulation has led to a method of minimizing the most significant of these (i.e. induced incidence deficiency), which has now been incorporated into the techniques. M.A.C.

N84-23598# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
VORTICAL FLOW EXPLORATION METHODS DEVELOPED FOR THE F1 WIND TUNNEL c34
Yves Brocard and Philippe Desplas *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 15 p refs In FRENCH; ENGLISH summary (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

Flow field investigation methods are developed by Office National d'Etudes et de Recherches Aerospatiales for its large wind tunnels. The means - exploring device, motorized probe holders, piloting computer system - used to position and point the probes are described. For vortex flow investigations five hole probes and two or three hot wire probes are used. The measuring and data processing techniques for the various probes are given. Finally typical results obtained in the O.N.E.R.A. F1 wind tunnel are presented. M.A.C.

N84-23599# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
NEW METHODS OF EXCITATION, ACQUISITION AND DATA REDUCTION ABOUT UNSTEADY WIND TUNNEL TESTS c02

Alain Gravelle and Roger Destuynder *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 15 p refs In FRENCH; ENGLISH summary (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

The unsteady wind tunnel tests performed by the structures department at Office National a'Etude et de Recherches Aerospatiales (ONERA) consist in measuring unsteady pressure fields and forces during rigid body motions of the models, control surfaces motions, as well as in acceleration measurements in the case of flutter models. The different types of model installation, excitation devices, data acquisition and data reduction methods and units are described herein. Different examples and results are given.
M.A.C.

N84-23600# Dornier-Werke G.m.b.H., Munich (West Germany).
EXPERIENCE IN ENGINE FACE, NON-STEADY, FLOW MEASUREMENTS THROUGH A SIDE AND BOTTOM ENGINE AIR INLET DUCT **c07**
Donald Ritchie and Reinhard Friedrichs (DFVLR, Brunswick) *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 18 p Sponsored by German Ministry of Defense (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

Two types of turbine engine air inlets are described. Models of these inlets are instrumented with high frequency pressure sensors and turbulence levels are measured in the wind tunnel for various mass flow ratios, angles of attack and sideslip angles. The instrumentation and methods of data reduction and analysis are described. Some results are shown to support the merit of high frequency, non stationary instrumentation. Non stationary data are compared with stationary measurements taken at the same time.
M.A.C.

N84-23601# Royal Aircraft Establishment, Bedford (England).
RECENT DEVELOPMENTS IN THE MEASUREMENT OF TIME-DEPENDENT PRESSURES **c02**
B. L. Welsh, C. R. Pyne, and B. E. Cripps *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 17 p (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

For flutter tests, involving time dependent force measurement, frequency sweep excitation is currently used to reduce tunnel running times, and minimize the risk of losing the model due to prolonged exposure to oscillatory conditions. This method is used to measure the time-dependent pressures on a wing oscillating in pitch using improved measurement and recording equipment. Wherever the system under test displays a linear response the raid sweep technique is in good agreement with the much slower method of discrete sinusoidal excitation. Where the system is non liner, eg in unsteady tunnels, significant differences between the techniques are expected and observed. The techniques and data from recent test are discussed.
M.A.C.

N84-23602# Verve Research Corp., Rockville, Md.
GENERAL AVIATION PILOT AND AIRCRAFT ACTIVITY SURVEY Final Report
J. Hairston, M. R. Wright, A. Narva, and J. Schwenk Dec. 1983 79 p refs
(Contract DTRS-57-82-C-00039)
(PB84-154301; DOT-TSC-FAA-83-2; FAA-MS-83-1) Avail: NTIS HC A05/MF A01 CSCL 01C

This report provides a summary and analysis of the data collected in the 1981 General Aviation Pilot and Aircraft Activity Survey. The survey was conducted at a random sample of airports across the nation throughout the months of July, August, and September, 1981 by the Federal Aviation Administration with the assistance of the Civil Air Patrol. The survey data provide information regarding the magnitude and characteristics of general aviation including: type and source of information services, trip length in time and distance, pilot age and certification. Estimates are made of total 1981 general aviation operations, fuel consumption and aircraft miles flown.
GRA

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N84-23603# Aeronautical Research Labs., Melbourne (Australia).
A FLOW VISUALISATION STUDY OF TIP VORTEX FORMATION
D. H. Thompson Nov. 1983 48 p refs
(ARL-Aero-Note-421; AR-002-988) Avail: NTIS HC A03/MF A01

The process by which a wing or rotor blade tip vortex is generated has been studied in a water tunnel using dye and hydrogen flow visualization techniques. In particular, the effects of the shape of the lateral tip edge on vortex formation have been examined. Three edge shapes were tested - a square tip, a square tip with bevelled fairing. The square tip was found to have the most complicated vortex system, with vortices forming on the tip edge face as well as above the wing. The observed flow features were generally similar to those proposed in the literature on the basis of pressure measurements, velocity measurements, and surface flow visualization in wind tunnels and on whirl towers. The vortex systems for the rounded and bevelled tips were less complicated. The shape of the tip edge has a significant effect on the structure of the tip vortex system, and may thus influence the tip loading characteristics. Verification of this will require further testing.
Author

N84-23604# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
AERODYNAMIC FORCES ON AN AIRSHIP HILL IN ATMOSPHERIC TURBULENCE
Mario J. B. Lagrange Apr. 1984 112 p refs
(UTIAS-277; ISSN-0082-5255) Avail: NTIS HC A06/MF A01

The aerodynamic forces acting on an airship placed in a turbulence flow field inside the UTIAS boundary layer wind tunnel were measured. This provided a data base upon which theoretical simulation of the airship's response to turbulence could be evaluated. The slender body theory, as used in this report, has failed to predict the behavior of a bare airship hull in turbulence. An extended three-dimensional slender body theory is also included. Although slightly better predictions were obtained, the extended theory is still far from providing accurate simulation. In general the slender body theory is an extremely conservative means of evaluating modern airship behavior in atmospheric turbulence. The method of simulation should be reevaluated.
B.W.

N84-23605*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PHYSICAL ASPECTS OF COMPUTING THE FLOW OF A VISCOUS FLUID
Unmeel B. Mehta Apr. 1984 50 p refs
(NASA-TM-85893; A-9650; NAS 1.15:85893) Avail: NTIS HC A03/MF A01 CSCL 01A

One of the main themes in fluid dynamics at present and in the future is going to be computational fluid dynamics with the primary focus on the determination of drag, flow separation, vortex flows, and unsteady flows. A computation of the flow of a viscous fluid requires an understanding and consideration of the physical aspects of the flow. This is done by identifying the flow regimes and the scales of fluid motion, and the sources of vorticity. Discussions of flow regimes deal with conditions of incompressibility, transitional and turbulent flows, Navier-Stokes and non-Navier-Stokes regimes, shock waves, and strain fields. Discussions of the scales of fluid motion consider transitional and turbulent flows, thin- and slender-shear layers, triple- and four-deck regions, viscous-inviscid interactions, shock waves, strain rates, and temporal scales. In addition, the significance and generation of vorticity are discussed. These physical aspects mainly guide computations of the flow of a viscous fluid.
Author

N84-23606*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

WATER-TUNNEL STUDY OF TRANSITION FLOW AROUND CIRCULAR CYLINDERS

D. Almosnino and K. W. McAlister May 1984 35 p refs (NASA-TM-85879; A-9606; NAS 1.15:85879; AVSCOM-TM-84-A-1) Avail: NTIS HC A03/MF A01 CSCL 20D

The recently reported phenomenon of asymmetric flow separation from a circular cylinder in the critical Reynolds number regime has been confirmed in a water-tunnel experiment. For the first time, an attempt was made to visualize the wake of the cylinder during the transition from subcritical to critical flow and to correlate the visualizations with lift and drag measurements. The occurrence of a dominant asymmetric-flow state was quite repeatable, both when increasing and decreasing the Reynolds number, resulting in a mean lift coefficient of C sub L approx 1.2 and a shift in the angle of the wake by about 12 deg. A distinctive step change in the drag and shedding frequency was also found to occur. A hysteresis was confirmed to exist in this region as the Reynolds number was cycled over the transition range. Both boundaries of the asymmetry appear to be supercritical bifurcations in the flow. The asymmetry was normally steady in the mean; however, there were instances when the direction of the asymmetry reversed and remained so for the duration of the Reynolds number sweep through this transition region. A second asymmetry was observed at a higher Reynolds number; however, the mean lift coefficient was much lower, and the direction of the asymmetry was not observed to reverse. Introducing a small local disturbance into the boundary layer was found to prevent the critical asymmetry from developing along the entire span of the cylinder. Author

N84-23607*# National Aeronautics and Space Administration, Washington, D. C.

COMPUTATION OF VISCOUS FLOWS OVER AIRFOILS, INCLUDING SEPARATION, WITH A COUPLING APPROACH

J. C. LeBalleur Jun. 1983 78 p refs Transl. into ENGLISH of "Calcul des Ecoulements a Forte Interaction Visqueuse au Moyen de Methoes de Couplage" rept. AGARD-CP-291 AGARD, Paris, Feb. 1981 36 p Presented at the Computation of Viscous-Inviscid Interaction Symp., Colorado Springs, 29 Sep. - 1 Oct. 1980 Original language document was announced as N81-26048 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77079; NAS 1.15:77079) Avail: NTIS HC A05/MF A01 CSCL 01A

Viscous incompressible flows over single or multiple airfoils, with or without separation, were computed using an inviscid flow calculation, with modified boundary conditions, and by a method providing calculation and coupling for boundary layers and wakes, within conditions of strong viscous interaction. The inviscid flow is calculated with a method of singularities, the numerics of which were improved by using both source and vortex distributions over profiles, associated with regularity conditions for the fictitious flows inside of the airfoils. The viscous calculation estimates the difference between viscous flow and inviscid interacting flow, with a direct or inverse integral method, laminar or turbulent, with or without reverse flow. The numerical method for coupling determines iteratively the boundary conditions for the inviscid flow. For attached viscous layers regions, an underrelaxation is locally calculated to insure stability. For separated or separating regions, a special semi-inverse algorithm is used. Comparisons with experiments are presented. A.R.H.

N84-23608*# Boeing Military Airplane Development, Seattle, Wash.

FURTHER DEVELOPMENT OF XTRAN3S COMPUTER PROGRAM Final Report, 10 Sep. 1982 - 10 Feb. 1984

C. J. Borland May 1984 72 p refs
(Contract NAS1-17072)
(NASA-CR-172335; NAS 1.26:172335) Avail: NTIS HC A04/MF A01 CSCL 01A

This report describes modifications and enhancements to XTRAN3S, a computer program for aerodynamic, static aeroelastic, and dynamic aeroelastic analysis of three-dimensional wings in the transonic speed regime. Modifications to the program include incorporation of a viscous boundary layer, modified coefficient and generalized force integration, direct input of airfoil surface coordinates and slopes, variable dimensions of computational arrays and a modified grid mapping transformation to improve computational stability for highly swept and tapered planforms. Results obtained with the modified program are included. Modifications discussed but not incorporated include a state matrix integration method, enhanced vectorization, and use of a cartesian physical mesh. Author

N84-23609# New York Univ., Westbury.

INVESTIGATION OF AERODYNAMICS OF NON AXISYMMETRIC PROJECTILES Final Report, 1 Mar. 1982 - 30 Nov. 1983

V. Zakkay, A. Agnone, and B. Prakasam Jan. 1984 39 p
(Contract DAAG29-82-K-0075)
(AD-A139107; ARO-19305.2-EG) Avail: NTIS HC A03/MF A01 CSCL 20/4

An experimental and analytical investigation of boattail projectile drag reduction was performed. The experiments were conducted at Mach 6.3, and at a free stream Reynolds number based on the cylinder diameter Re = 3.7 million. Heat transfer measurements were also performed, and the results indicate that the flow field was predominantly laminar upstream of the boattail. The results of the analysis indicate that inviscid codes may be used to provide guidelines for possible three-dimensional geometric configurations for the reduction in the drag. The discrepancies between experimental results and theoretical predictions are significant towards the end. Both the experimental and theoretical results indicate that the triangular boattail yields the largest drag reduction. Since the predominant drag of the boattail is the base drag, it is essential for future research that accurate measurements be performed in the base region of the model in order to have a better comparison between the various boattail configurations. GRA

N84-23610# Ballistic Research Labs., Aberdeen Proving Ground, Md.

FLIGHT DATA ON LIQUID-FILLED SHELL FOR SPIN-UP INSTABILITIES Final Report

W. P. DAmico Feb. 1984 52 p
(DA Proj. 1L1-62618-AH-80)
(AD-A139136; AD-F300388; ARBRL-MR-03334; ARBRL-IMR-778) Avail: NTIS HC A04/MF A01 CSCL 19/4

The stability of a spinning projectile can be adversely affected when a liquid payload is present. Due to the impulsive launch of a spin-stabilized projectile, the liquid payload is subjected to unsteady and time-dependent processes. For example, the liquid must adjust to the rapid spin of the projectile casing. This process is normally called liquid spin-up. For many projectiles, the liquid spin-up process encompasses a large portion of the trajectory, and in fact many flight instabilities have occurred during this spin-up time frame. Flight data for spin-up instabilities of 155mm projectiles are presented and qualitatively discussed with respect to a recently developed model for yaw moments during spin-up. GRA

N84-23611# Michigan Univ., Ann Arbor. Interferometry Lab.

INTFL-8401 COMPUTER TOMOGRAPHY FOR INTERFEROMATIC AERODYNAMIC MEASUREMENTS Final Report, 20 Oct. 1980 - 31 Dec. 1983

C. M. Vest 1984 40 p
(Contract DAAG29-81-K-0015)
(AD-A139591; ARO-17698.4-EG) Avail: NTIS HC A03/MF A01 CSCL 09/2

Under this research program the author has studied and developed several topics associated with the use of multidirectional holographic interferometry with data analysis by computer tomography for application to complex aerodynamic flows. In this technique, interferometer data are recorded virtually instantaneously by pulsed laser holographic interferometry and later are read out photometrically, digitized, and then processed by a computer to produce density maps in a set of planar cross sections of a

three-dimensional flow. This program has included development of computer tomography codes of a new type, development of a microcomputer-controlled system for scanning interferograms and preprocessing the data, initial development of a new (non-holographic) hybrid optical/digital technique for recording information equivalent to that normally recorded on an interferogram of a flow, the execution of a simple prototype experiment, and considerable progress toward development of instrumentation for three-dimensional density measurement in a low-speed wind tunnel. Author (GRA)

N84-23612# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
NUMERICAL AERODYNAMIC ANALYSIS OF A FREE FALLING AUTOROTATING PLATE Ph.D. Thesis
C. R. Gallaway Oct. 1983 144 p
(AF Proj. 2307)
(AD-A138900; AFIT-DS/AA/83-2) Avail: NTIS HC A07/MF A01 CSCL 01/2

A computational method coupling the three degrees of freedom flight mechanics equations and the two dimensional Navier-Stokes equations was developed which could be used to predict the flight path of a free falling, autorotating, two dimensional flat plate. The two dimensional incompressible Navier-Stokes equations were cast in a body fixed coordinate system. The corresponding velocities were cast in an inertial reference system. The equations were represented by backward-time-central-space finite differences and solved using a successive-over-relaxation iteration technique. The resulting aerodynamic coefficients were entered into the three degrees of freedom flight mechanics equations. The system of ordinary differential equations was solved using an Adams open formula to predict the movement of the plate. New boundary conditions for the Navier-Stokes equations solver were derived from the movement of the plate. The process was repeated to advance the solution in time. The computation method was used to calculate the flow field around a flat plate forced to rotate at nondimensional angular velocities of 1.0, 2.0, and 4.0. Finally, the flight path of a free falling autorotating plate was predicted using the computational procedure. The validity of the overall approach was demonstrated by comparison with experiment. GRA

N84-23570# Calspan Field Services, Inc., Arnold Air Force Station, Tenn. Propulsion Wind Tunnel Facility.
A REVIEW AND AN UPDATE OF THE FDP SPECIALISTS MEETING (LONDON) ON WALL INTERFERENCE IN WIND TUNNELS
Travis W. Binion, Jr. and Edward M. Kraft *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 12 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23571# Technische Univ., Berlin (West Germany). Inst. fuer Luft- und Raumfahrt.
A SHORT NOTE ON RECENT ADVANCES IN THE ADAPTIVE WALL TECHNIQUE FOR 3D-MODEL TESTS AT THE TU-BERLIN
U. Ganzer *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 2 p ref Sponsored in part by the German Minister of Research and Technology (BMFT) and The German Research Association (DFG) (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23573# Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.
DISTURBANCES FROM VENTILATED TUNNEL WALLS IN AEROFOIL TESTING
M. C. P. Firmin and P. H. Cook *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 15 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23575*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
HIGH REYNOLDS NUMBER TESTS OF THE CAST 10-2/DOA2 TRANSONIC AIRFOIL AT AMBIENT AND CRYOGENIC TEMPERATURE CONDITIONS
E. Stanewsky (DFVLR, Goettingen, West Germany), F. Demurie (DFVLR, Goettingen, West Germany), E. J. Ray, and C. B. Johnson *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 13 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01 CSCL 01A

N84-23581# Lockheed Missiles and Space Co., Sunnyvale, Calif.
PRACTICAL SOLUTIONS TO SIMULATION DIFFICULTIES IN SUBSCALE WIND TUNNEL TESTS
L. E. Ericsson and J. P. Reding *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 12 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23582# National Aeronautical Establishment, Ottawa (Ontario). Unsteady Aerodynamics Lab.
RECENT DEVELOPMENTS AND FUTURE DIRECTIONS IN DYNAMIC STABILITY RESEARCH AT NAE, OTTAWA
K. J. Orlik-Rueckemann, E. S. Hanff, and M. E. Beyers *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 6 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23588# National Aerospace Lab., Amsterdam (Netherlands).
HALF-MODEL TESTING IN THE NLR HIGH SPEED WIND TUNNEL HST: ITS TECHNIQUE AND APPLICATION
S. J. Boersen and A. Elsenaar *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 15 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23590*# General Dynamics/Convair, San Diego, Calif.
DESIGN OF ADVANCED TECHNOLOGY MANEUVERING AIRCRAFT MODELS FOR THE NATIONAL TRANSONIC FACILITY
Stanley A. Griffin, A. A. McClain, and A. P. Madsen (General Dynamics, Fort Worth, Tex.) *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 15 p refs Sponsored by NASA. Langley Research Center (For primary document see N84-23564 14-09)
Avail: NTIS HC A22/MF A01 CSCL 01A

N84-23591# Aeritalia S.p.A., Torino (Italy). Gruppo Velivoli da Combattimento.
DESIGN OF A WIND TUNNEL AFTERBODY MODEL FOR THE DEVELOPMENT OF A TRANSONIC COMBAT AIRCRAFT
G. Bertolone and E. Farinazzo *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 15 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23592# Calspan Field Services, Inc., Arnold Air Force Station, Tenn.
TRANSONIC NOZZLE-AFTERBODY FLOW FIELD MEASUREMENTS USING A LASER DOPPLER VELOCIMETER
Fred L. Heltsley, Billy J. Walker (Army Missile Command, Redstone Arsenal, Ala.), and Robert H. Nichols (AEDC) *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 14 p refs Sponsored by AEDC (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23595# Aircraft Research Association Ltd., Bedford (England).
RECENT DEVELOPMENTS IN STORE SEPARATION AND GRID SURVEY TECHNIQUES USING THE ARA TWO-STING RIG
M. E. Wood *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 13 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23599# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
NEW METHODS OF EXCITATION, ACQUISITION AND DATA REDUCTION ABOUT UNSTEADY WIND TUNNEL TESTS
Alain Gravelle and Roger Destuynder *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 15 p refs In FRENCH; ENGLISH summary (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23601# Royal Aircraft Establishment, Bedford (England).
RECENT DEVELOPMENTS IN THE MEASUREMENT OF TIME-DEPENDENT PRESSURES
B. L. Welsh, C. R. Pyne, and B. E. Cripps *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 17 p (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23687# Calspan Advanced Technology Center, Buffalo, N.Y. Physical Sciences Dept.
MACH NUMBER AND DENSITY EFFECTS IN THE MIXING OF SUPERSONIC JETS
C. Padova, D. W. Boyer, and W. H. Wurster *In* APL The 14th JANNAF Plume Technol. Meeting, Vol. 1 1983 p 107-116 refs (For primary document see N84-23678 14-20)
(Contract F04611-80-C-0011)
Avail: NTIS HC A07/MF A01 CSCL 01/1

N84-24186# Texas Univ., Austin. Dept. of Aerospace Engineering and Engineering Mechanics.
ARTIFICIAL MASS CONCEPT AND TRANSONIC VISCOUS FLOW EQUATION
G. S. Dulikravich and P. Niederdrenk *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 259-268 (For primary document see N84-24173 14-59)
(AD-P002946) Avail: NTIS HC A99/MF A01 CSCL 12/1

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N84-23613# National Transportation Safety Board, Washington, D. C.
AIRCRAFT ACCIDENT REPORT. EASTERN AIR LINES, INCORPORATED, LOCKHEED L-1011, N334EA, MIAMI INTERNATIONAL AIRPORT, MIAMI, FLORIDA, MAY 5, 1983
9 Mar. 1984 70 p
(NTSB/AAR-84/04) Avail: NTIS HC A04/MF A01

At 0856, on May 5, 1983, Eastern Air Lines, Inc., Flight 855, a Lockheed L-1011, N334EA, with 10 crewmembers and 162 passengers on board, departed Miami International Airport enroute to Nassau, Bahamas. About 0915.15, while descending through 15,000 feet, the low oil pressure light on the No.2 engine illuminated. The No. 2 engine was shut down, and the captain decided to return to Miami to land. The airplane was cleared to Miami and began a climb to FL 200. While en route to Miami, the low oil pressure lights for engines Nos. 1 and 3 illuminated. At 0928:20, while at 16,000 feet, the No. 3 engine flamed out. At 0933:20, the No. 1 engine flamed out while the flightcrew was attempting to restart the No. 2 engine. The airplane descended without power from about 13,000 feet to about 4,000 feet, at which time the No. 2 engine was restarted. The airplane made a one-engine landing at Miami International Airport at 0946. There were no injuries to the occupants. Author

N84-23614# Naval Air Development Center. Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
PHYSIOLOGICAL ACCEPTABILITY TESTS OF THE MODIFIED SJU-5/A EJECTION SEAT FOR THE F-18 AIRCRAFT Report, May - Jun. 1983
K. Miller Jan. 1984 26 p
(AD-A139416; NADC-84009-60) Avail: NTIS HC A03/MF A01 CSCL 05/5

The program was conducted to demonstrate physical acceptability of the Martin-Baker SJU-5/A (modified) Escape System planned for installation in the Navy's F-18 aircraft. Twenty ejection tests were run on the Naval Air Development Center Ejection Tower Facility using both anthropomorphic dummies and human volunteer test subjects. As a result of this program the seat was found to be physiologically acceptable. GRA

N84-23615# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
PASSIVE ARM RESTRAINT CURTAIN (PARC) FOR NAVY AIRCRAFT EJECTION SEATS Phase Report, period ending CY 1983
T. J. Zenobi Nov. 1983 30 p
(ONR Proj. W05-84)
(AD-A139435; NADC-83138-60) Avail: NTIS HC A03/MF A01 CSCL 01/3

In an effort related to reducing arm flail injuries due to ejection windblast, the Navy is evaluating a passive arm restraint system for retrofit on Navy aircraft ejection seats. The term passive implies that the system will operate without the crewmember having to perform tasks other than what he currently performs (in a seat without an arm restraint system) to ready himself for flight. The Passive Arm Restraint Curtain (PARC) is designed to not only prevent arm flail but also to be cost effective and easily retrofitted. Prototypes have been fabricated and attached to current Navy ejection seats where they have been subjected to function feasibility testing and human factors evaluations. Preliminary results show the PARC to be a viable approach for providing passive arm restraint, but more development and testing is required to refine the design to insure operational acceptability.
Author (GRA)

N84-23616# Naval Submarine Medical Research Lab., Groton, Conn.
A TEST OF ELECTROLUMINESCENT PANELS FOR A HELICOPTER EMERGENCY ESCAPE LIGHTING SYSTEM Interim Report
B. L. Ryack, S. M. Luria, and V. Robbins 16 Feb. 1984 14 p
(AD-A139478; NSMRL-1018) Avail: NTIS HC A02/MF A01 CSCL 01/3

The effectiveness of a lighting system composed of electroluminescent panels and proposed for use in illuminating escape hatches was tested. It was visible to light-adapted subjects in turbid water at the distance and viewing angles required by the Naval Air Development Center. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N84-23617*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NASA-FAA HELICOPTER MICROWAVE LANDING SYSTEM CURVED PATH FLIGHT TEST
H. N. Swenson, J. R. Hamlin, and G. W. Wilson Feb. 1983 21 p refs Prepared in cooperation with Army Research and Technology Lab.
(NASA-TM-85933; A-9670; NAS 1.15:85933; USAAVSCOM-TR-84-A-14) Avail: NTIS HC A03/MF A01 CSCL 17G

An ongoing series of joint NASA/FAA helicopter Microwave Landing System (MLS) flight tests was conducted at Ames Research Center. This paper deals with tests done from the spring

through the fall of 1983. This flight test investigated and developed solutions to the problem of manually flying curved-path and steep glide slope approaches into the terminal area using the MLS and flight director guidance. An MLS-equipped Bell UH-1H helicopter flown by NASA test pilots was used to develop approaches and procedures for flying these approaches. The approaches took the form of Straight-in, U-turn, and S-turn flightpaths with glide slopes of 6 deg, 9 deg, and 12 deg. These procedures were evaluated by 16 pilots from various elements of the helicopter community, flying a total of 221 hooded instrument approaches. Flying these curved path and steep glide slopes was found to be operationally acceptable with flight director guidance using the MLS. Author

N84-23618# Lincoln Lab., Mass. Inst. of Tech., Lexington.
GENERAL AVIATION TCAS (TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM) AVIONICS (GATCAS)
R. L. Briggs, J. DiBartolo, D. I. Underwood, and D. J. Callahan 17 Feb. 1984 102 p
(Contracts DOT-FA72WAI-877; F19628-80-C-0002)
(AD-A139145; ATC-115; DOT/FAA/RD-82/86) Avail: NTIS HC A06/MF A01 CSCL 17/7

Experimental Traffic Alert and Collision Avoidance System (TCAS) avionics developed for the FAA at M.I.T. Lincoln Laboratory are described. The objective of the program under which this equipment was developed was to assess the feasibility of providing a small, low-cost unit for general aviation usage. The experimental general aviation TCAS (GATCAS) avionics incorporates a new system architecture using a microprogrammed sequencer, a 16-bit microprocessor and a low-power, solid state transmitter appropriate to the class of aircraft expected to employ GATCAS. The general aviation unit is designed to operate below 10,000 feet in densities of up to 0.02 aircraft/nmi2, and to provide a pilot warning time (TAU sub R) of 25 seconds. Assuming a track acquisition time of 10 seconds and a maximum closing speed of 300 knots, the required theoretical range of GATCAS is 3.4 nmi. The report includes (as an appendix) a cost analysis for general aviation TCAS avionics. Author (GRA)

N84-23619# Oak Ridge National Lab., Tenn.
EVALUATION OF ARCTIC TEST OF TRITIUM RADIOLUMINESCENT LIGHTING Final Report, Jan. - Feb. 1983
K. W. Haff, J. A. Thompkins, and F. N. Case Aug. 1983 65 p
(AF Proj. 2054)
(AD-A139176; AFESC/ESL-TR-83-35) Avail: NTIS HC A04/MF A01 CSCL 17/7

The arctic test of radioluminescent (RL) lighting was conducted on response to the Alaskan Air Command (AAC) mission requirement for a self-sustaining airfield light system suitable for arctic deployment. The test showed durability and dependability of tritium lights. It also showed the system, as now designed, can support the operations of small, slow-moving type aircraft. For larger, faster-moving aircraft the lights offer only marginal performance and would have to be supported with other lighting aids to be totally acceptable. Author (GRA)

N84-23552# Joint Publications Research Service, Arlington, Va.
MINISTRY OFFICIAL ON IMPROVING ALL-WEATHER AVIATION CAPABILITIES
T. Anodina *In its* USSR Rept.: Transportation (JPRS-UTR-84-004) 24 Feb. 1984 p 1-5 Transl. into ENGLISH from Grazhdanskaya Aviats. (Moscow), no. 12, Dec. 1983 p 14-15 (For primary document see N84-23551 14-01)
Avail: NTIS HC A04/MF A01

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N84-23620*# California Univ., Los Angeles. Dept. of Mechanical, Aerospace and Nuclear Engineering.
A STUDY OF AEROELASTIC AND STRUCTURAL DYNAMIC EFFECTS IN MULTI-ROTOR SYSTEMS WITH APPLICATION TO HYBRID HEAVY LIFT VEHICLES Final Report, 1981 - 1983
Peretz P. Friedmann Apr. 1984 12 p
(Grant NAG2-116)
(NASA-CR-173505; NAS 1.26:173505) Avail: NTIS HC A02/MF A01 CSCL 01C

An aeroelastic model suitable for the study of aeroelastic and structural dynamic effects in multirotor vehicles simulating a hybrid heavy lift vehicle was developed and applied to the study of a number of diverse problems. The analytical model developed proved capable of modeling a number of aeroelastic problems, namely: (1) isolated blade aeroelastic stability in hover and forward flight, (2) coupled rotor/fuselage aeromechanical problem in air or ground resonance, (3) tandem rotor coupled rotor/fuselage problems, and (4) the aeromechanical stability of a multirotor vehicle model representing a hybrid heavy lift airship (HHLA). The model was used to simulate the ground resonance boundaries of a three bladed hingeless rotor model, including the effect of aerodynamic loads, and the theoretical predictions compared well with experimental results. Subsequently the model was used to study the aeromechanical stability of a vehicle representing a hybrid heavy lift airship, and potential instabilities which could occur for this type of vehicle were identified. The coupling between various blade, supporting structure and rigid body modes was identified. M.A.C.

N84-23621*# Kentron International, Inc., Hampton, Va. Aerospace Technologies Div.
APPLICATION OF NEAR-TERM TECHNOLOGY TO A MACH 2.0 VARIABLE-SWEEP-WING, SUPERSONIC-CRUISE EXECUTIVE JET
F. L. Beissner, Jr., W. A. Lovell, A. Warner Robins, and E. E. Swanson Mar. 1984 60 p ref
(Contract NAS1-16000)
(NASA-CR-172321; NAS 1.26:172321) Avail: NTIS HC A04/MF A01 CSCL 01C

The impact of variable sweep wing technology with relaxed static stability requirements on a supersonic-cruise executive jet with transatlantic range was assessed. The baseline vehicle utilized modified, current-technology engines and titanium structures produced with superplastic forming and diffusion bonding; this vehicle meets study requirements for both supersonic-cruise and low-speed characteristics. The baseline concept has a ramp weight of 64,500 pounds with a crew of two and eight passengers. Its Mach 2.0 cruise range is nearly 3,500 nautical miles; its Mach 0.9 cruise range is over 5,000 nautical miles. Takeoff, landing, and balanced field length requirements were calculated for a composite variant and are all less than 5,000 feet. Author

N84-23622*# National Aeronautics and Space Administration, Washington, D. C.
AERODYNAMIC CHARACTERISTICS OF THE 40- BY 80/80- BY 120-FOOT WIND TUNNEL AT NASA AMES RESEARCH CENTER
Victor R. Corsiglia, Lawrence E. Olson, and Michael D. Falarski Apr. 1984 25 p refs Previously announced in IAA as A84-25728
(NASA-TM-85946; A-9675; NAS 1.15:85946) Avail: NTIS HC A02/MF A01 CSCL 14B

The design and testing of vane sets and air-exchange inlet for the 40 x 80/80 x 120-ft wind tunnel at NASA Ames are reported. Boundary-layer analysis and 2D and 3D inviscid panel codes are employed in computer models of the system, and a 1/10-scale 2D facility and a 1/50-scale 3D model of the entire wind tunnel are used in experimental testing of the vane sets. The results are presented in graphs, photographs, drawings, and diagrams are discussed. Generally good agreement is found between the predicted and measured performance. T.K. (IAA)

N84-23623*# National Aeronautics and Space Administration, Washington, D. C.
DEVELOPMENT OF MCAERO WING DESIGN PANEL METHOD WITH INTERACTIVE GRAPHICS MODULE Final Report
J. Dennis Hawk and Dean R. Bristow Washington NASA Apr. 1984 40 p refs
(Contract NAS1-17176)
(NASA-CR-3775; NAS 1.60:3775) Avail: NTIS HC A03/MF A01 CSCL 01C

A reliable and efficient iterative method has been developed for designing wing section contours corresponding to a prescribed subcritical pressure distribution. The design process is initialized by using MCAERO (MCAIR 3-D Subsonic Potential Flow Analysis Code) to analyze a baseline configuration. A second program DMCAERO is then used to calculate a matrix containing the partial derivative of potential at each control point with respect to each unknown geometry parameter by applying a first-order expansion to the baseline equations in MCAERO. This matrix is calculated only once but is used in each iteration cycle to calculate the geometry perturbation and to analyze the perturbed geometry. The potential on the new geometry is calculated by linear extrapolation from the baseline solution. This extrapolated potential is converted to velocity by numerical differentiation, and velocity is converted to pressure by using Bernoulli's equation. There is an interactive graphics option which allows the user to graphically display the results of the design process and to interactively change either the geometry or the prescribed pressure distribution. B.W.

N84-23624# Naval Ship Research and Development Center, Bethesda, Md. Aviation and Surface Effects Dept.
USE OF HELICOPTERS TO DEVELOP OPERATIONAL CONCEPTS FOR V/STOL (VERTICAL AND SHORT TAKEOFF AND LANDING) AIRCRAFT IN NAVAL MISSIONS Final Report
P. S. Montana Aug. 1983 20 p
(AD-A139354; DTNSRDC/ASED-83/07) Avail: NTIS HC A02/MF A01 CSCL 01/3

Vertical and short takeoff and landing (V/STOL) aircraft promise new operational capabilities for the Navy. In the past, new vehicle types have been slow in gaining acceptance because of the difficulty in visualizing how these new vehicles should be employed. Once built, experience gained with the vehicle evolved into an operational concept exploiting its best qualities. Now, competition for fiscal resources has reached a level from which it may be difficult to justify the development of any new vehicle without having a well-defined operational concept in hand. This report discusses the use of existing large helicopters to develop operational concepts for V/STOL in naval applications. Author (GRA)

N84-23625# BDM Corp., McLean, Va.
DARPA (DEFENSE ADVANCED RESEARCH PROJECTS AGENCY) AIR VEHICLES TECHNOLOGY OFFICE TECHNICAL TASK ORDER CONTRACT Final Technical Report
31 Aug. 1983 11 p
(Contract MDA903-83-C-0103; ARPA Order 4295)
(AD-A138887; BDM/W-83-319-TR) Avail: NTIS HC A02/MF A01 CSCL 15/3

This task entailed assessing the applicability of third generation cruise missile technology to future Naval weapons systems and identifying the potential payoff of selected technology programs. This task investigated the technical feasibility of employing aerostats as platforms for surveillance radars to detect low-flying aircraft for AFSOUTH. This task assessed the state of ongoing programs relating to display and sensor technologies which might be applicable to close combat vehicles. This task continues work for the Critical Nodes Program, determining the appropriate munitions that are to be used against critical nodes. It emphasizes current, highest priority critical nodes. In order to fully evaluate various candidate technologies for passively detecting and tracking low-altitude, low-radar cross-section targets using various classes of illumination, a comprehensive program plan is needed. This task involved preparing a plan to identify gaps and present alternatives for evaluating the tactical potential of the class of systems under consideration. This task encompassed identifying emerging technologies which are applicable to Army equipments to provide product improvements or enhancements with substantial payoffs in increased mission-related performance. There have been a number of major DARPA programs assessed prior to initiation to determine their worth. This task entails assessing the technical and related management risks of projected DARPA Air Vehicles programs. GRA

N84-23626# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
STATUS REPORT OF THE PROGRAMS [STATUSBEREICHT DER PROGRAMME]
1983 59 p In GERMAN
Avail: NTIS HC A04/MF A01

The status of the different MBB programs is reviewed. The programs are: transport and passenger aircraft, military aircraft, defense systems, helicopters, astronautics, marine systems, traffic, and electronic systems and special techniques. Author (ESA)

N84-23627# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Drehfluegler.
MODERN HELICOPTER DEVELOPMENT IN GERMANY [DIE MODENE HUBSCHRAUBERENTWICKLUNG IN DEUTSCHLAND]
Kurt Pfleiderer 16 Nov. 1983 50 p In GERMAN Lecture presented at Essen
(MBB-UD-395-83-O) Avail: NTIS HC A03/MF A01

The status of helicopter development is presented. The evolution in Germany since 1936 is reviewed. The life cycle cost principle is explained and the means of cost reduction are presented. The technical possibilities and limits of helicopters are treated with a view to increasing their share of the market. The development trends (fuel saving, carbon fiber reinforced plastics) are described. Author (ESA)

N84-23574# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
GROUND/FLIGHT TEST TECHNIQUES AND CORRELATION
Ph. Poisson-Quinton *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 14 p refs In FRENCH; ENGLISH summary (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23589# Calspan Field Services, Inc., Arnold Air Force Station, Tenn.
TEST TECHNIQUES FOR JET EFFECTS ON FIGHTER AIRCRAFT
Earl A. Price, Jr. and William L. Peters *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 17 p refs Sponsored by AEDC (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23597# British Aerospace Aircraft Group, Brough (England).
THE ACCELERATED LIGHT MODEL TECHNIQUE OF STORE SEPARATION AS DEVELOPED AND USED AT BRITISH AEROSPACE, BROUGH
Robert E. Burns *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 12 p (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23641*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FUEL SYSTEM RESEARCH AND TECHNOLOGY: AN OVERVIEW OF THE NASA PROGRAM
Bert R. Phillips *In its* Assessment of Alternative Aircraft Fuels Apr. 1984 p 111-120 (For primary document see N84-23630 14-07)
Avail: NTIS HC A09/MF A01 CSCL 01C

N84-23644*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
ANALYSIS OF FUEL SYSTEM TECHNOLOGY FOR BROAD PROPERTY FUELS
George A. Coffinberry *In* NASA. Lewis Research Center Assessment of Alternative Aircraft Fuels Apr. 1984 p 141-158

refs (For primary document see N84-23630 14-07)
Avail: NTIS HC A09/MF A01 CSCL 01C

N84-23645*# Lockheed-California Co., Burbank.
FUEL SYSTEM DESIGN CONCEPTS FOR BROAD PROPERTY FUELS
Edward F. Versaw *In* NASA. Lewis Research Center Assessment of Alternative Aircraft Fuels Apr. 1984 p 159-170 (For primary document see N84-23630 14-07)
Avail: NTIS HC A09/MF A01 CSCL 01C

N84-23646*# Simmonds Precision Products, Inc., Vergennes, Vermont.
ECONOMIC IMPACT OF FUEL PROPERTIES ON TURBINE POWERED BUSINESS AIRCRAFT
F. D. Powell *In* NASA. Lewis Research Center Assessment of Alternative Aircraft Fuels Apr. 1984 p 171-184 refs (For primary document see N84-23630 14-07)
(Contract NAS3-22827)
Avail: NTIS HC A09/MF A01 CSCL 01C

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N84-23628# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
DIGITAL CAPABILITY FOR COCKPIT TELEVISION SENSOR INSTRUMENTATION SYSTEMS Final Report, 1 Aug. 1980 - 30 Jun. 1983
D. O. Hague, Jr. Nov. 1983 65 p
(AF Proj. 6095)
(AD-A139432; AFWAL-TR-83-1156) Avail: NTIS HC A04/MF A01 CSCL 14/3

An approach is presented for incorporating digital capability into a video instrumentation system consisting of a solid-state CCD television camera and video cassette recorder. The approach consists of passive data acquisition from a MIL STD 1553B Multiplex Serial Data Bus with the acquired data being encoded into an unused portion of the video signal. The digital data is encoded as manchester format luminance excursions in the normally blanked horizontal rasters of the video vertical blanking interval. A laboratory prototype of this device (Bus-Monitor/Video-Encoder or BM/VE) was developed along with a device (or Video Decoder) for recovery of the digital data from the video signal. The BM/VE and Video Decoder were used in laboratory testing to establish the performance parameters and design requirements needed for an actual airborne application of the BM/VE approach. A video encoding format for fault-tolerant data recovery is also developed and presented. Test results demonstrate that the primary limitation of this approach is the video cassette recorder bandwidth and that even the lower bandwidth video recorders can support application-dependent capacities of 1-3 thousand digital 16-bit words per second. GRA

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N84-23629*# Pratt and Whitney Aircraft, West Palm Beach, Fla. Government Products Div.
V/STOL MODEL FAN STAGE RIG DESIGN REPORT
J. G. Cheatham and T. L. Creason Aug. 1983 280 p refs
(Contract NAS3-22779)
(NASA-CR-174688; NAS 1.26:174688; PWA/GPD-FR-17826)
Avail: NTIS HC A13/MF A01 CSCL 21E

A model single-stage fan with variable inlet guide vanes (VIGV) was designed to demonstrate efficient point operation while providing flow and pressure ratio modulation capability required for a V/STOL propulsion system. The fan stage incorporates a split-flap VIGV with an independently actuated ID flap to permit independent modulation of fan and core engine airstreams, a flow splitter integrally designed into the blade and vanes to completely segregate fan and core airstreams in order to maximize core stream supercharging for V/STOL operation, and an EGV with a variable leading edge fan flap for rig performance optimization. The stage was designed for a maximum flow size of 37.4 kg/s (82.3 lb/s) for compatibility with LeRC test facility requirements. Design values at maximum flow for blade tip velocity and stage pressure ratio are 472 m/s (1550 ft/s) and 1.68, respectively. Author

N84-23630*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ASSESSMENT OF ALTERNATIVE AIRCRAFT FUELS
Washington Apr. 1984 188 p refs Conf. held in Cleveland, 2-3 Nov. 1983
(NASA-CP-2307; E-1878; NAS 1.55:2307) Avail: NTIS HC A09/MF A01 CSCL 21D

The purpose of this symposium is to provide representatives from industry, government, and academia concerned with the availability and quality of future aviation turbine fuels with recent technical results and a status review of DOD and NASA sponsored fuels research projects. The symposium has included presentations on the potential crude sources, refining methods, and characteristics of future fuels; the effects of changing fuel characteristics on the performance and durability of jet aircraft components and systems; and the prospects for evolving suitable technology to produce and use future fuels. For individual titles, see N84-23631 through N84-23647.

N84-23631*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TRENDS OF JET FUEL DEMAND AND PROPERTIES **c28**
Robert Friedman *In its* Assessment of Alternative Aircraft Fuels Apr. 1984 p 1-10 refs (For primary document see N84-23630 14-07)
Avail: NTIS HC A09/MF A01 CSCL 21D

Petroleum industry forecasts predict an increasing demand for jet fuels, a decrease in the gasoline-to-distillate (heavier fuel) demand ratio, and a greater influx of poorer quality petroleum in the next two to three decades. These projections are important for refinery product analyses. The forecasts have not been accurate, however, in predicting the recent, short term fluctuations in jet fuel and competing product demand. Changes in petroleum quality can be assessed, in part, by a review of jet fuel property inspections. Surveys covering the last 10 years show that average jet fuel freezing points, aromatic contents, and smoke points have trends toward their specification limits. Author

N84-23632*# Exxon Research and Engineering Co., Linden, N.J.
THE EFFECT OF PROPERTY CHANGES ON JET FUEL PRODUCIBILITY AND COST **c28**
G. M. Varga, Jr., A. R. Cunningham, J. F. Gorgol, A. J. Graf, and G. A. Oliver *In* NASA. Lewis Research Center Assessment of Alternative Aircraft Fuels Apr. 1984 p 11-22 (For primary document see N84-23630 14-07)
Avail: NTIS HC A09/MF A01 CSCL 21D

An investigation of the effect of property relaxation on jet A producibility and cost in the U.S. has been completed under NASA sponsorship by Exxon Research and Engineering Company. This presentation reviews the results obtained. Linear pro-

gramming optimization models have been used. Model input included petroleum product demand and property data, estimates of crude qualities, and information on refinery processes. The time period considered was 1978 to 2010. Author

N84-23633*# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.

USAF SHALE OIL PROGRAM STATUS c28

Charles L. Delaney *In* NASA. Lewis Research Center Assessment of Alternative Aircraft Fuels Apr. 1984 p 23-30 (For primary document see N84-23630 14-07)

Avail: NTIS HC A09/MF A01 CSCL 21D

The test and evaluation program on shale derived fuel being conducted by the Air Force is intended to accomplish the minimum amount of testing necessary to assure both the safe use of shale oil derived turbine fuels in operational USAF aircraft and its compatibility with USAF handling systems. This program, which was designed to take advantage of existing R&D testing programs, began in 1981. However, due to a problem in acquiring the necessary fuel, the testing program was suspended until July 1983 when an additional sample of shale derived fuel was received. Tentatively, the Air Force is planning to make three relatively minor revisions to the procurement specifications requirements for the production shale derived fuel. These are: (1) Aromatic Contest (min) - 9% (by volume); (2) Nitrogen (max - 20 ppm by weight); and (3) Antioxidants - 9.1 g/100 gal (U.S.) B.W.

N84-23634*# United Technologies Research Center, East Hartford, Conn.

INFLUENCE OF FUEL CHEMICAL PROPERTIES ON GAS TURBINE COMBUSTORS

Thomas J. Rosfjord *In* NASA. Lewis Research Center Assessment of Alternative Aircraft Fuels Apr. 1984 p 31-46 (For primary document see N84-23630 14-07)

Avail: NTIS HC A09/MF A01 CSCL 21E

In an attempt to rigorously study the fuel chemical property influence, UTRC (United Technologies Research Center) (under contract to NASA Lewis Research Center) has conducted an experimental program using 25 test fuels. The burner was a 12.7 cm dia cylindrical device consisting of six sheet metal louvers. A single pressure atomizing injector and air swirler were centrally mounted with the conical dome. Fuel physical properties were de-emphasized by using fuel injectors which produced highly atomized, and hence rapidly vaporizing sprays. A substantial fuel spray characterization effort was conducted to allow selection of nozzles which assured that such sprays were achieved for all fuels. The fuels were specified to cover the following wide ranges of chemical properties: hydrogen, 9.1 to 15 (wt) pct; total aromatics, 0 to 100 (vol) pct; and naphthalene, 0 to 30 (vol) pct. They included standard fuel (e.g., Jet A, JP4), specialty products (e.g., decalin, xylene tower bottoms) and special fuel blends. Included in this latter group were six, 4-component blends prepared to achieve parametric variations in fuel hydrogen, total aromatics and naphthalene contents. Author

N84-23635*# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.

FUEL PROPERTY EFFECTS ON USAF GAS TURBINE ENGINE COMBUSTORS AND AFTERBURNERS

Curtis M. Reeves *In* NASA. Lewis Research Center Assessment of Alternative Aircraft Fuels Apr. 1984 p 47-62 refs (For primary document see N84-23630 14-07)

Avail: NTIS HC A09/MF A01 CSCL 21E

Since the early 1970s, the cost and availability of aircraft fuel have changed drastically. These problems prompted a program to evaluate the effects of broadened specification fuels on current and future aircraft engine combustors employed by the USAF. Phase 1 of this program was to test a set of fuels having a broad range of chemical and physical properties in a select group of gas turbine engine combustors currently in use by the USAF. The fuels ranged from JP4 to Diesel Fuel number two (DF2) with hydrogen content ranging from 14.5 percent down to 12 percent by weight, density ranging from 752 kg/sq m to 837 kg/sq m, and viscosity ranging from 0.830 sq mm/s to 3.245 sq mm/s. In addition, there was a broad range of aromatic content and physical properties attained by using Gulf Mineral Seal Oil, Xylene Bottoms, and 2040 Solvent as blending agents in JP4, JP5, JP8, and DF2. The objective of Phase 2 was to develop simple correlations and models of fuel effects on combustor performance and durability. The major variables of concern were fuel chemical and physical properties, combustor design factors, and combustor operating conditions. B.W.

N84-23636*# Pratt and Whitney Aircraft Group, West Palm Beach, Fla.

FUEL PROPERTY EFFECTS ON USN GAS TURBINE COMBUSTORS

A. I. Masters, S. A. Mosier, and C. J. Nowack (Naval Air Propulsion Center) *In* NASA. Lewis Research Center Assessment of Alternative Aircraft Fuels Apr. 1984 p 63-72 (For primary document see N84-23630 14-07)

Avail: NTIS HC A09/MF A01 CSCL 21E

For several years the Department of Defense has been sponsoring fuel accommodation investigations with gas turbine engine manufacturers and supporting organizations to quantify the effect of changes in fuel properties and characteristics on the operation and performance of military engine components and systems. Inasmuch as there are many differences in hardware between the operational engines in the military inventories, due to differences in design philosophy and requirements, efforts were initially expended to acquire fuel effects data from rigs simulating the hot sections of these different engines. Correlations were then sought using the data acquired to produce more general, generic relationships that could be applied to all military gas turbine engines regardless of their origin. Finally, models could be developed from these correlations that could predict the effect of fuel property changes on current and future engines. This presentation describes some of the work performed by Pratt and Whitney Aircraft, under Naval Air Propulsion Center sponsorship, to determine the effect of fuel properties on the hot section and fuel system of the Navy's TF30-P-414 gas turbine engine. Author

N84-23637*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NASA BROAD-SPECIFICATION FUELS COMBUSTION TECHNOLOGY PROGRAM c25

James S. Fear *In its* Assessment of Alternative Aircraft Fuels Apr. 1984 p 75-78 (For primary document see N84-23630 14-07)

Avail: NTIS HC A09/MF A01 CSCL 21B

The NASA Broad-Specification Fuels Combustion Technology Program was initiated in response to concerns that the supply of high-quality petroleum middle distillates for jet fuel, abundant in the past, would diminish in availability toward the end of the century. The specific program objective is to evolve the combustion system technology required to use fuels with moderate ranges of broadened properties in the engines used on commercial jet aircraft. The first phase of the program, in which effects of the use of broadened-properties fuels were identified and technology with the potential to offset these effects was also identified, has been completed. The second phase, in which the technology identified in Phase 1 is being refined, will be completed within the next three months. B.W.

N84-23638*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.

NASA/GENERAL ELECTRIC BROAD-SPECIFICATION FUELS COMBUSTION TECHNOLOGY PROGRAM c25

Willard J. Dodds *In* NASA. Lewis Research Center Assessment of Alternative Aircraft Fuels Apr. 1984 p 79-88 refs (For primary document see N84-23630 14-07)

Avail: NTIS HC A09/MF A01 CSCL 21B

The NASA/General Electric Broad Specification Fuels Combustion Technology Program is being conducted to evolve and demonstrate the technology required to use broadened-properties fuels in current and next generation commercial aircraft engines. The first phase of this program, completed in 1982, involved the

design and test evaluation of three different combustor concepts. All combustors were designed for the General Electric CF6-80A engine envelope and operating conditions, using Experimental Referee Broad Specification (ERBS) fuel having a fuel hydrogen content of 12.8% by weight. Several different configurations of each combustor concept were evaluated in a series of high pressure sector combustor component tests. A total of 25 sector tests were conducted during phase 1. Combustor metal temperatures, emissions, exit temperature profiles, and radiant heat flux were measured over the full range of steady-state operating conditions using four fuels having nominal hydrogen contents between 11.8 and 14%. During the current phase 2 program, the two most promising concepts from phase 1 are being further refined and evaluated. For phase 2 testing, two additional fuels representing a wider range of fluidity and volatility are also being used in combustion system tests. Author

N84-23639*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.

ANALYTICAL FUEL PROPERTY EFFECTS: SMALL COMBUSTORS

J. D. Cohen *In* NASA. Lewis Research Center Assessment of Alternative Aircraft Fuels Apr. 1984 p 89-98 (For primary document see N84-23630 14-07)

Avail: NTIS HC A09/MF A01 CSCL 21E

The study performed in Phase 1 of this program applies only to a T700/CT7 engine family type combustor functioning in the engine as defined and does not necessarily apply to other cycles or combustors of differing stoichiometry. The study was not extended to any of the fuel delivery accessories such as pumps or control systems, nor was there any investigation of potential systems problems which might arise as a consequence of abnormal properties such as density which might affect delivery schedules or aromatics content which might affect fuel system seals. The T700/CT7 engine is a front drive turboshaft or turboprop engine in the 1500-1800 shp (1120-1340 kW) class as currently configured with highpower core flows of about 10 lb/sec (4.5 kg/sec). It employs a straight-through annular combustion system less than 5 in. (12.5 cm) in length utilizing a machined ring film cooled construction and twelve low-pressure air blast fuel injectors. Commercial and Naval versions employ two 0.5 Joule capacitive discharge surface gap ignitors. B.W.

N84-23640*# Pratt and Whitney Aircraft Group, West Palm Beach, Fla.

THE NASA BROAD SPECIFICATION FUELS COMBUSTION TECHNOLOGY PROGRAM AT PRATT AND WHITNEY c25

Robert P. Lohmann *In* NASA. Lewis Research Center Assessment of Alternative Aircraft Fuels Apr. 1984 p 99-110 refs (For primary document see N84-23630 14-07)

Avail: NTIS HC A09/MF A01 CSCL 21B

The technology required to accommodate the use of broadened properties fuels in commercial aircraft engine combustors with minimum impact on the emissions, performance, durability and engine operational characteristics is discussed. Emphasis was placed on defining the potential for reducing the fuel sensitivity of the reference combustion system through design refinements and the introduction of more advanced technology combustors. To this end the tests conducted included the evaluation of variations of three different combustor concepts representing progressively more advanced technology levels. It was demonstrated that reduced fuel hydrogen content has adverse impacts on current single stage combustors; the best opportunities for reducing the fuel sensitivity of these combustors are through improved fuel injectors and advanced liner cooling and structural concepts and that the advanced technology staged and variable geometry combustor concepts have inherent operational flexibility that can be exploited to accommodate changes in fuel composition. Also, advanced technology combustor concepts were evaluated. A variable geometry combustor capable of airflow modulation during operation and a new concept which is a further evolution of the Vorbix combustor are discussed. R.J.F.

N84-23641*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FUEL SYSTEM RESEARCH AND TECHNOLOGY: AN OVERVIEW OF THE NASA PROGRAM c05

Bert R. Phillips *In its* Assessment of Alternative Aircraft Fuels Apr. 1984 p 111-120 (For primary document see N84-23630 14-07)

Avail: NTIS HC A09/MF A01 CSCL 01C

The interactions between the design and operation of aircraft fuel systems and the properties of alternative aircraft fuels are discussed. An overview of fuels system research and technology in terms of its rationale, its progress, and future plans is given. The measurement of ambient air temperatures for a wide range of seasonal and geographic variations, design studies on the use of fuels with increased as well as conventional freezing temperatures, the evaluation of fuel heating systems, and the low temperature behavior of fuels are among the topics discussed. R.J.F.

N84-23642*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

RESEARCH ON AVIATION FUEL INSTABILITY c28

Charles E. Baker, David A. Bittker, Stephen M. Cohen, and Gary T. Seng *In its* Assessment of Alternative Aircraft Fuels Apr. 1984 p 121-130 refs (For primary document see N84-23630 14-07)

Avail: NTIS HC A09/MF A01 CSCL 21D

The problems associated with aircraft fuel instability are discussed. What is currently known about the problem is reviewed and a research program to identify those areas where more research is needed is discussed. The term fuel instability generally refers to the gums, sediments, or deposits which can form as a result of a set of complex chemical reactions when a fuel is stored for a long period at ambient conditions or when the fuel is thermally stressed inside the fuel system of an aircraft. R.J.F.

N84-23643*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

IN-FLIGHT ATMOSPHERIC AND FUEL TANK TEMPERATURE MEASUREMENTS c28

Roger Svehla *In its* Assessment of Alternative Aircraft Fuels Apr. 1984 p 131-140 refs (For primary document see N84-23630 14-07)

Avail: NTIS HC A09/MF A01 CSCL 21D

In order to maintain an adequate supply of aviation turbine fuels in the future, fuels may have properties different from those now currently produced. One possible change is an increase in the freezing point temperature. If this should occur, it will be necessary to know the low temperature flow characteristics of these fuels. Studies to date involved both the use of computer models and subscale fuel tank simulators. They indicate that steep temperature gradients occur near the upper and lower surfaces which can result in freezing at the bottom, even though the bulk fuel temperature is above the freezing point. In order to obtain flight data to verify computer model and simulator results, a Lockheed L1011 research aircraft at Palmdale, California was instrumented with a vertical thermocouple rake in an inboard tank and an outboard tank. The tests were conducted with one of the two instrumented tanks maintained full for either two or five hours at altitudes of at least 10668 meters (35000 ft). Other flight parameters such as Mach number, air temperature, fuel quantity, and heading were also recorded. R.J.F.

N84-23644*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.

ANALYSIS OF FUEL SYSTEM TECHNOLOGY FOR BROAD PROPERTY FUELS c05

George A. Coffinberry *In* NASA. Lewis Research Center Assessment of Alternative Aircraft Fuels Apr. 1984 p 141-158 refs (For primary document see N84-23630 14-07)

Avail: NTIS HC A09/MF A01 CSCL 01C

An analytical study was performed in order to assess relative performance and economic factors involved with alternative advanced fuel systems for future commercial aircraft operating

with broad property fuels. Significant results, with emphasis on design practicality from the engine manufacturer' standpoint, are highlighted. Several advanced fuel systems were modeled to determine as accurately as possible the relative merits of each system from the standpoint of compatibility with broad property fuel. Freezing point, thermal stability, and lubricity were key property issues. A computer model was formulated to determine the investment incentive for each system. Results are given. R.J.F.

N84-23645*# Lockheed-California Co., Burbank.
FUEL SYSTEM DESIGN CONCEPTS FOR BROAD PROPERTY FUELS **c05**
Edward F. Versaw *In* NASA. Lewis Research Center Assessment of Alternative Aircraft Fuels Apr. 1984 p 159-170 (For primary document see N84-23630 14-07)
Avail: NTIS HC A09/MF A01 CSCL 01C

The results of a study assessing the impact of using jet fuel with relaxed specification properties on an aircraft fuel system are given. The study objectives were to identify credible values for specific fuel properties which might be relaxed, to evolve advanced fuel system designs for airframe and engines which would permit use of the specified relaxed properties fuels, and to evaluate performance of the candidate advanced fuel systems and the relaxed property fuels in a typical transport aircraft. The study used as a baseline, the fuel system incorporated in the Lockheed Tristar. This aircraft is powered bt three RB.211-524 Rolls-Royce engines and incorporates a Pratt and Whitney ST6C-421 auxiliary power unit for engine starting and inflight emergency electrical power. The fuel property limits examined are compared with commercial Jet A kerosene and the NASA RFP fuel properties. A screening of these properties established that a higher freezing point and a lower thermal stability would impact fuel system design more significantly than any of the other property changes. Three candidate fuel systems which combine the ability to operate with fuels having both a high freeze point and a low thermal stability are described. All candidates employ bleed air to melt fuel freeze-out prior to starting the APU or an inoperable engine. The effects of incorporating these systems on aircraft weight and engine specific fuel consumption are given. R.J.F.

N84-23646*# Simmonds Precision Products, Inc., Vergennes, Vermont.
ECONOMIC IMPACT OF FUEL PROPERTIES ON TURBINE POWERED BUSINESS AIRCRAFT **c05**
F. D. Powell *In* NASA. Lewis Research Center Assessment of Alternative Aircraft Fuels Apr. 1984 p 171-184 refs (For primary document see N84-23630 14-07)
(Contract NAS3-22827)
Avail: NTIS HC A09/MF A01 CSCL 01C

The principal objective was to estimate the economic impact on the turbine-powered business aviation fleet of potential changes in the composition and properties of aviation fuel. Secondary objectives include estimation of the sensitivity of costs to specific fuel properties, and an assessment of the directions in which further research should be directed. The study was based on the published characteristics of typical and specific modern aircraft in three classes; heavy jet, light jet, and turboprop. Missions of these aircraft were simulated by computer methods for each aircraft for several range and payload combinations, and assumed atmospheric temperatures ranging from nominal to extremely cold. Five fuels were selected for comparison with the reference fuel, nominal Jet A. An overview of the data, the mathematic models, the data reduction and analysis procedure, and the results of the study are given. The direct operating costs of the study fuels are compared with that of the reference fuel in the 1950 time-frame, and the anticipated fleet costs and fuel break-even costs are estimated. R.J.F.

N84-23647*# Southwest Research Inst., San Antonio, Tex.
FUEL PROPERTY EFFECTS ON NAVY AIRCRAFT FUEL SYSTEMS **c28**
C. A. Moses *In* NASA. Lewis Research Center Assessment of Alternative Aircraft Fuels Apr. 1984 p 185-190 (For primary document see N84-23630 14-07)
Avail: NTIS HC A09/MF A01 CSCL 21D

Problems of ensuring compatibility of Navy aircraft with fuels that may be different than the fuels for which the equipment was designed and qualified are discussed. To avoid expensive requalification of all the engines and airframe fuel systems, methodologies to qualify future fuels by using bench-scale and component testing are being sought. Fuel blends with increasing JP5-type aromatic concentration were seen to produce less volume swell than an equivalent aromatic concentration in the reference fuel. Futhermore, blends with naphthenes, decalin, tetralin, and naphthalenes do not deviate significantly from the correlation line of aromatic blends, Similar results are found with tensile strenth and elongation. Other elastomers, sealants, and adhesives are also being tested. R.J.F.

N84-23648*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CONTINGENCY POWER CONCEPTS FOR HELICOPTER TURBOSHAFT ENGINE
Robert Hirschkron (General Electric Co., Lynn, Mass.), Richard H. Davis (General Electric Co., Lynn, Mass.), David N. Goldstein (General Electric Co., Lynn, Mass.), John F. Haynes (General Electric Co., Lynn, Mass.), and James W. Gauntner 1984 14 p refs Presented at the 40th Ann. Forum of the American Helicopter Society, Arlington, Va., 16-18 May 1984
(NASA-TM-83679; E-2128; NAS 1.15:83679; A-83-40-66-7000)
Avail: NTIS HC A02/MF A01 CSCL 21E

Twin helicopter engines are often sized by power requirement of safe mission completion after the failure of one of the two engines. This study was undertaken for NASA Lewis by General Electric Co. to evaluate the merits of special design features to provide a 2-1/2 minute Contingency Power rating, permitting an engine size reduction. The merits of water injection, cooling flow modulation, throttle push and an auxiliary power plant were evaluated using military life cycle cost (LCC) and commercial helicopter direct operating cost (DOC) merit factors in a rubber engine/rubber aircraft scenario. Author

N84-23649*# Rensselaer Polytechnic Inst., Troy, N. Y. Gas Dynamics Lab.
INVESTIGATION OF THE EFFECTS OF PRESSURE GRADIENT, TEMPERATURE AND WALL TEMPERATURE RATIO ON THE STAGNATION POINT HEAT TRANSFER FOR CIRCULAR CYLINDERS AND GAS TURBINE VANES Final Report
H. T. Nagamatsu and R. E. Duffy Apr. 1984 43 p refs Sponsored in part by National Science Foundation
(Grant NAG3-292)
(NASA-CR-174667; NAS 1.26:174667) Avail: NTIS HC A03/MF A01 CSCL 21E

Low and high pressure shock tubes were designed and constructed for the purpose of obtaining heat transfer data over a temperature range of 390 to 2500 K, pressures of 0.3 to 42 atm, and Mach numbers of 0.15 to 1.5 with and without pressure gradient. A square test section with adjustable top and bottom walls was constructed to produce the favorable and adverse pressure gradient over the flat plate with heat gages. A water cooled gas turbine nozzle cascade which is attached to the high pressure shock tube was obtained to measuse the heat flux over pressure and suction surfaces. Thin-film platinum heat gages with a response time of a few microseconds were developed and used to measure the heat flux for laminar, transition, and turbulent boundary layers. The laminar boundary heat flux on the shock tube wall agreed with Mirel's flat plate theory. Stagnation point heat transfer for circular cylinders at low temperature compared with the theoretical prediction, but for a gas temperature of 922 K the heat fluxes were higher than the predicted values. Preliminary flat plate heat transfer data were measured for laminar, transition, and turbulent boundary layers with and without pressure gradients for free-stream temperatures of 350 to 2575 K and flow Mach numbers of 0.11 to 1.9. The experimental heat flux data were correlated with the laminar and turbulent theories and the agreement was good at low temperatures which was not the case for higher temperatures. Author

N84-23650*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A MODEL FOR REACTION RATES IN TURBULENT REACTING FLOWS
Wallace Chinitz (Cooper Union, New York) and John S. Evans May 1984 45 p refs
(NASA-TM-85746; L-15679; NAS 1.15:85746) Avail: NTIS HC A03/MF A01 CSCL 21E

To account for the turbulent temperature and species-concentration fluctuations, a model is presented on the effects of chemical reaction rates in computer analyses of turbulent reacting flows. The model results in two parameters which multiply the terms in the reaction-rate equations. For these two parameters, graphs are presented as functions of the mean values and intensity of the turbulent fluctuations of the temperature and species concentrations. These graphs will facilitate incorporation of the model into existing computer programs which describe turbulent reacting flows. When the model was used in a two-dimensional parabolic-flow computer code to predict the behavior of an experimental, supersonic hydrogen jet burning in air, some improvement in agreement with the experimental data was obtained in the far field in the region near the jet centerline. Recommendations are included for further improvement of the model and for additional comparisons with experimental data. Author

N84-23651# Rolls-Royce Ltd., Derby (England).
FUTURE ENGINE TECHNOLOGIES AND THEIR EFFECT ON MAINTENANCE
P. Curley 1983 41 p
(PNR-90190; Reprint-903) Avail: NTIS HC A03/MF A01

The effects on maintenance of changes in turbofan engines to decrease fuel consumption, improve reliability and environmental acceptability, and reduce overall cost of ownership are discussed. Increased mechanization of maintenance tasks, and adoption of operationally oriented engine management policy are predicted. With nondestructive test techniques and the introduction of retirement for cause, more economic use of major rotating components is possible. The introduction of electronic control systems with associated test facilities speeds up troubleshooting with gains in despatch reliability. Author (ESA)

N84-23586# Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
FLUID DYNAMIC ASPECTS OF TURBINE ENGINE TESTING
James G. Mitchell *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 19 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23600# Dornier-Werke G.m.b.H., Munich (West Germany).
EXPERIENCE IN ENGINE FACE, NON-STEADY, FLOW MEASUREMENTS THROUGH A SIDE AND BOTTOM ENGINE AIR INLET DUCT
Donald Ritchie and Reinhard Friedrichs (DFVLR, Brunswick) *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 18 p Sponsored by German Ministry of Defense (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23686# Aeronautical Research Associates of Princeton, Inc., N. J.
AIRCRAFT EXHAUST PLUME SIGNATURE PREDICTIONS FOR NON-AXISYMMETRIC MULTIPLE ENGINE INSTALLATIONS
B. E. Pearce, R. W. McCullough, and R. D. Thorpe *In* APL The 14th JANNAF Plume Technol. Meeting, Vol. 1 1983 p 87-96 refs (For primary document see N84-23678 14-20)
Avail: NTIS HC A07/MF A01 CSCL 21E

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N84-23652*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF AERODYNAMIC AND ANGLE-OF-ATTACK UNCERTAINTIES ON THE BLENDED ENTRY FLIGHT CONTROL SYSTEM OF THE SPACE SHUTTLE FROM MACH 10 TO 2.5
Howard W. Stone and Richard W. Powell Apr. 1984 291 p
(NASA-TP-2283; L-15719; NAS 1.60:2283) Avail: NTIS HC A13/MF A01 CSCL 01C

A six-degree-of-freedom simulation analysis has been performed for the Space Shuttle Orbiter during entry from Mach 10 to 2.5 with realistic off-nominal conditions using the entry flight control system specified in May 1978. The off-nominal conditions included the following: (1) aerodynamic uncertainties, (2) an error in deriving the angle of attack from onboard instrumentation, (3) the failure of two of the four reaction control-system thrusters on each side, and (4) a lateral center-of-gravity offset. With combinations of the above off-nominal conditions, the control system performed satisfactorily with a few exceptions. The cases that did not exhibit satisfactory performance displayed the following main weaknesses. Marginal performance was exhibited at hypersonic speeds with a sensed angle-of-attack error of 4 deg. At supersonic speeds the system tended to be oscillatory, and the system diverged for several cases because of the inability to hold lateral trim. Several system modifications were suggested to help solve these problems and to maximize safety on the first flight: alter the elevon-trim and speed-brake schedules, delay switching to rudder trim until the rudder effectiveness is adequate, and reduce the overall rudder loop gain. These and other modifications were incorporated in a flight-control-system redesign in May 1979. Author

N84-23653*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A MATHEMATICAL MODEL OF THE UH-60 HELICOPTER
Kathryn B. Hilbert Apr. 1984 44 p refs
(NASA-TM-85890; A-9646; NAS 1.15:85890; USAAVSCOM-TM-84-A-2) Avail: NTIS HC A03/MF A01 CSCL 01C

This report documents the revisions made to a ten-degree-of-freedom, full-flight envelope, generic helicopter mathematical model to represent the UH-60 helicopter accurately. The major modifications to the model include fuselage aerodynamic force and moment equations specific to the UH-60, a canted tail rotor, a horizontal stabilator with variable incidence, and a pitch bias actuator (PBA). In addition, this report presents a full set of parameters and numerical values which describe the helicopter configuration and physical characteristics. Model validation was accomplished by comparison of trim and stability derivative data generated from the UH-60 math model with data generated from a similar total force and moment math model. Author

N84-23654*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LOW-SPEED WIND-TUNNEL STUDY OF THE HIGH-ANGLE-OF-ATTACK STABILITY AND CONTROL CHARACTERISTICS OF A CRANKED-ARROW-WING FIGHTER CONFIGURATION
Sue B. Grafton May 1984 39 p refs
(NASA-TM-85776; L-15762; NAS 1.15:85776) Avail: NTIS HC A03/MF A01 CSCL 01C

The low-speed, high-angle-of-attack stability and control characteristics of a fighter configuration incorporating a cranked arrow wing were investigated in the Langley 30- by 60-foot tunnel as part of a NASA/General Dynamics cooperative research program to investigate the application of advanced wing designs to combat aircraft. Tests were conducted on a baseline configuration and on several modified configurations. The results show that the baseline configuration exhibited a high level of maximum lift

but displayed undesirable longitudinal and lateral-directional stability characteristics at high angles of attack. Various wing modifications were made which improved the longitudinal and lateral-directional stability characteristics of the configuration at high angles of attack. However, most of the modifications were detrimental to maximum lift. Author

N84-23655*# National Aeronautics and Space Administration, Washington, D. C.
A STUDY OF HELICOPTER GUST RESPONSE ALLEVIATION BY AUTOMATIC CONTROL
Shigeru Saito Dec. 1983 103 p refs
(NASA-TM-85870; A-9578; NAS 1.15:85870) Avail: NTIS HC A06/MF A01 CSCL 01C

Two control schemes designed to alleviate gust-induced vibration are analytically investigated for a helicopter with four articulated blades. One is an individual blade pitch control scheme. The other is an adaptive blade pitch control algorithm based on linear optimal control theory. In both controllers, control inputs to alleviate gust response are superimposed on the conventional control inputs required to maintain the trim condition. A sinusoidal vertical gust model and a step gust model are used. The individual blade pitch control, in this research, is composed of sensors and a pitch control actuator for each blade. Each sensor can detect flapwise (or lead-lag or torsionwise) deflection of the respective blade. The acturator controls the blade pitch angle for gust alleviation. Theoretical calculations to predict the performance of this feedback system have been conducted by means of the harmonic method. The adaptive blade pitch control system is composed of a set of measurements (oscillatory hub forces and moments), an identification system using a Kalman filter, and a control system based on the minimization of the quadratic performance function. B.W.

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N84-23656# Science Applications, Inc., Orlando, Fla.
SYNTHETIC FLIGHT TRAINING SYSTEM STUDY Final Report, Sep. - Dec. 1983
23 Dec. 1983 269 p
(Contract N61339-82-D-0006)
(AD-A139392) Avail: NTIS HC A12/MF A01 CSCL 05/8

The primary purpose of this report was to investigate flight simulator commonality. Visual system commonality was investigated using an advanced development program called the Visual System Component Development Program (VSCDP) as a baseline. In addition, the study investigated commonality issues of such subsystems as motion platforms, instructional features, computer hardware and software, student stations, etc. Author (GRA)

N84-23657# Dayton Univ., Ohio.
NOZZLE TESTS FOR SIMULATING HEAVY RAIN IN A WIND TUNNEL Final Report, Feb. 1983 - Feb. 1984
J. K. Luers and I. B. Fiscus Wright-Patterson AFB, Ohio AFWAL Jan. 1984 32 p
(Contract F33615-83-K-3008; AF Proj. 2404)
(AD-A139566; AFWAL-TR-83-3131) Avail: NTIS HC A03/MF A01 CSCL 14/2

Tests were conducted with a vibrating tube nozzle system to assess the ability of the system to realistically simulate the natural heavy rain environment at wind tunnel airspeeds of 65 to 125 mph. The nozzle system was specifically designed to achieve the large droplet sizes (-2mm) that are characteristic of the heavy rain environment. The nozzle system also produced the appropriate total water volume to simulate rain rates from 25 mm/hr to over 500 mm/hr. The test results established the allowable velocity differential between the airstream and water velocity that resulted in large droplet formation. Velocity differentials exceeding the allowable or critical value resulted in the shattering of large drops into a spectrum of much smaller drops. Author (GRA)

N84-23565*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
OPERATIONAL EXPERIENCE WITH THE NATIONAL TRANSONIC FACILITY
L. W. McKinney *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 8 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01 CSCL 01B

N84-23566# National Aerospace Lab., Amsterdam (Netherlands).
THE EUROPEAN TRANSONIC WINDTUNNEL (ETW) Status Report
R. J. North, F. Maurer, J. Prieur, J. A. Schimanski, and J. A. Tizard *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 12 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23567# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France). Dept. d'Aerothermodynamique.
THE T2 CRYOGENIC WIND TUNNEL WITH SELF-ADAPTABLE WALLS AT ONERA/CERT [LA SOUFFLERIE CRYOGENIQUE A PAROIS AUTO-ADAPTABLES T2 DE LONERA/CERT]
A. Mignosi and J. B. Dor *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 12 p refs In FRENCH; ENGLISH summary (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23568# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany).
THE CRYOGENIC WIND TUNNEL COLOGNE
G. Viehweger *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 8 p (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23569# Institut Aerotechnique de Saint-Cyr, Saint-Cyr-l'Ecole (France).
PRODUCING A CRYOGENIC GUST IN AN EIFFEL TYPE ATMOSPHERIC WIND TUNNEL WITH SHORT GUST [PRODUCTION DUNE RAFALE CRYOGENIQUE DANS UNE SOUFFLERIE DE TYPE EIFFEL ATMOSPHERIQUE A RAFALE COURTE]
Dominique Chauvet and Christian Dujarric (Serice Technique des Programmes Aeronautiques, Paris) *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 17 p refs In FRENCH (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23585# Aeronautica Macchi S. p. A., Varese (Italy).
USE OF A SMALL SCALE WIND TUNNEL AND MODEL SHOP AT AERONAUTICA MACCHI AS AN INDUSTRIAL TOOL
R. Marazzi, D. Malara, M. Lucchesini, S. Comoretto, and F. Pacori *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 15 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23593# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Hauptabt. Windkanaele.
THE NEW CALIBRATION TANK FOR ENGINE SIMULATORS AT DFVLR GOETTINGEN
B. Binder, E. Melzer, and R. Wulf *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 9 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23594# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
NEW TPS CALIBRATION BENCH, AND EJECTOR TESTS
J. P. Becle, J. Coste, and J. Leynaert *In* AGARD Wind Tunnels

and Testing Tech. Feb. 1984 12 p refs In FRENCH; ENGLISH summary (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23596# Fluidyne Engineering Corp., Minneapolis, Minn.
A SELF-CONTAINED CAPTIVE TRAJECTORY SYSTEM FOR A BLOWDOWN WIND TUNNEL
C. D. Christopherson, D. N. Kamis, D. M. Nelson, and R. D. Week *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 9 p (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N84-23658# Joint Publications Research Service, Arlington, Va.
USSR REPORT: POLITICAL AND SOCIOLOGICAL AFFAIRS, NO. 1389. CHAPTERS FROM BREZHNEV'S REMINISCENCES
23 Mar. 1983 85 p Transl. into ENGLISH from Noviy Mir (Moscow), no. 1, Jan. 1983 p 3-67
(JPRS-83124) Copyright. Avail: NTIS HC A05/MF A01

Observations of social and economic conditions in Moldavia, the creative genius of the Soviet people as reflected in their space program, and the place of the Communist party in Soviet life are discussed. For individual titles, see N84-23659 through N84-23659.

N84-23659# Joint Publications Research Service, Arlington, Va.
COSMIC OCTOBER
In its USSR Rept.: Political and Sociol. Affairs (JPRS-83124) 23 Mar. 1983 p 30-62 Transl. into ENGLISH from Noviy Mir (Moscow), no. 1, Jan. 1983 (For primary document see N84-23658 14-12)
Avail: NTIS HC A05/MF A01

Aspects of socialism which permitted the Soviet Union to launch the first artificial satellite are elaborated in this review of the early days of the Soviet space program. Construction of the Baykonur launch complex; rocket booster design and tests; cosmonaut selection and acclamation; and the contributions of scientists and technicians are discussed. An exhortation to young Soviets to the scientific, economic, and technical development of their country is described. A.R.H.

N84-23820# Department of the Air Force, Washington, D.C. International Law Div.
PEACEFUL USE AND SELF DEFENSE IN OUTER SPACE
A. J. Butler *In* AF Academy Proc. of the 1983 Symp. on Mil. Space Commun. and Opeations 1983 p 87-92 refs Previously announced in IAA as A84-17038 (For primary document see N84-23809 14-32)
(AD-P002155) Avail: NTIS HC A07/MF A01 CSCL 22/1

N84-23821# Teledyne Brown Engineering, Huntsville, Ala.
SOVIET MILITARY CAPABILITIES IN SPACE
Nicholas L. Johnson *In* AF Academy Proc. of the 1983 Symp. on Mil. Space Commun. and Operations 1983 p 93-97 (For primary document see N84-23809 14-32)
(AD-P002156) Avail: NTIS HC A07/MF A01 CSCL 22/1

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N84-23660# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
SATELLITE ORBIT THEORY FOR A SMALL COMPUTER Interim Report
R. I. Abbot, P. Cefola, and S. F. Tse 15 Dec. 1983 39 p
(Contract F19628-82-K-0002; AF Proj. 2309)
(AD-A139406; AFGL-TR-84-0105) Avail: NTIS HC A03/MF A01 CSCL 09/2

This document describes a computer program put onto an LSI-11 microprocessor with 64KB of memory which can provide accurate ephemerides for GPS (Global Positioning System) satellites. The satellite dynamics include averaged orbital element rates due to J2, tesseral resonances, solar radiation pressure and third body perturbations from both the Moon and the Sun. These rates are first integrated up to and across a satellite pass of interest, and a two point Hermitian interpolating polynomial is established for each mean element. Short periodic Fourier coefficients due to J2 and the Moon and Sun are next computed, and three point Lagrangian interpolating polynomials are finally used to provide osculating orbital elements at arbitrary times during the pass. This computer program includes an analytical Lunar/Solar ephemeris so it is self-contained except for input mean orbital elements. Partial derivatives have been implemented which will give the capability to fit observations of the satellites and to consequently obtain the necessary mean elements. The program can be modified quite easily to handle synchronous satellites by modifying the subroutine modules for tesseral resonant perturbations and lunar-solar short-periodics. With the present overlay scheme, considerable expansion of the program is possible to obtain more accuracy and versatility. GRA

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N84-23825# OAO Corp., Greenbelt, Md.
DYNAMIC SPACECRAFT SIMULATORS IN MILITARY SPACE GROUND SYSTEMS
Robert S. Smith, III, Phil David, and David A. Goodwin *In* AF Academy Proc. of the 1983 Symp. on Mil. Space Commun. and Operations 1983 p 119-126 (For primary document see N84-23809 14-32)
(AD-P002159) Avail: NTIS HC A07/MF A01 CSCL 14/2

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N84-23661*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
SATELLITE TRACKING AND EARTH DYNAMICS RESEARCH PROGRAMS Final Report, 1 Jul. 1959 - 31 Dec. 1983
Michael R. Pearlman Apr. 1984 37 p refs
(Grant NGR-09-015-002)
(NASA-CR-173502; NAS 1.26:173502) Avail: NTIS HC A03/MF A01 CSCL 22A

Following an upgrading program, ranging performance capabilities of a satellite-tracking pulsed laser system were assessed in terms of range accuracy, range noise, data yield, and reliability. With a shorter laser pulse duration (2.5 to 3.0 NSEC) and a new analog pulse processing system, the systematic range errors were reduced to 3 to 5 cm and range noise was reduced to 5 to 16 cm and range noise was reduced to 5 to 15 cm on Starlette and BE-C, and 10 to 18 cm on LAGEOS. Maximum pulse repetition rate was increased to 30 pulses per minute and significant

improvement was made in signal to noise ratio by installing a 3 A interference filter and by reducing the range gate window to 200 to 400 nsec. The solution to a problem involving leakage of a fraction of the laser oscillator pulse through the pulse chopper was outlined. R.S.F.

N84-23662*# Ohio State Univ., Columbus. ElectroScience Lab.
ENGINEERING CALCULATIONS FOR COMMUNICATIONS SATELLITE SYSTEMS PLANNING Interim Report, 15 Jan. - 15 Jul. 1983
C. H. Martin, D. J. Gonsalvez, C. A. Levis, and C. W. Wang Dec. 1983 36 p
(Grant NAG3-159)
(NASA-CR-173532; NAS 1.26:173532; ESL-713533-4) Avail: NTIS HC A03/MF A01 CSCL 22B

Progress is reported on a computer code to improve the efficiency of spectrum and orbit utilization for the Broadcasting Satellite Service in the 12 GHz band for Region 2. It implements a constrained gradient search procedure using an exponential objective function based on aggregate signal to noise ratio and an extended line search in the gradient direction. The procedure is tested against a manually generated initial scenario and appears to work satisfactorily. In this test it was assumed that alternate channels use orthogonal polarizations at any one satellite location. M.A.C.

N84-23663# Alabama Univ., Huntsville. Huntsville School of Engineering.
PERSHING II SIMULATION STUDIES. DEBRIS DYNAMICS AND 2.75 ROCKET 6-DOF (DEGREE OF FREEDOM) Final Report
P. A. Tilley and D. A. Hall Jul. 1983 89 p
(Contract DAAH01-82-D-A008)
(AD-A139130; AD-E950499; DRSMI/RD-CR-83-20) Avail: NTIS HC A05/MF A01 CSCL 19/4

Pershing II simulation studies were performed using the program MSIXB1 during this task. Analysis and documentation of MSIXB1 and the 2.75 6-DOF simulation were completed for future use in debris studies. Author (GRA)

N84-23680# Science Applications, Inc., Los Angeles, Calif.
APPLICATION OF THE CONTAM III COMPUTER MODEL TO THE PREDICTION OF HEATING, FORCES, AND CONTAMINATION ON A COMMUNICATIONS SATELLITE
R. J. Hoffman *In* APL The 14th JANNAF Plume Technol. Meeting, Vol. 1 1983 p 9-40 refs (For primary document see N84-23678 14-20)
Avail: NTIS HC A07/MF A01 CSCL 22/2

N84-23812# Kaman Sciences Corp., Colorado Springs, Colo.
SATELLITE SYSTEM SURVIVABILITY
Frank H. Shelton *In* AF Academy Proc. of the 1983 Symp. on Mil. Space Commun. and Operations 1983 p 29-31 (For primary document see N84-23809 14-32)
(AD-P002147) Avail: NTIS HC A07/MF A01 CSCL 22/2

N84-23815# Naval War Coll., Newport, R. I. Center for Advanced Research.
OPERATION OF COMMUNICATIONS SATELLITE SYSTEMS DURING CRISIS AND CONFLICT
Robert L. Dickman *In* AF Academy Proc. of the 1983 Symp. on Mil. Space Commun. and Operations 1983 p 45-51 (For primary document see N84-23809 14-32)
(AD-P002150) Avail: NTIS HC A07/MF A01 CSCL 22/2

N84-23824# National Defence Headquarters, Ottawa (Ontario).
OPTIMIZATION OF SATELLITE ORBITAL PARAMETERS FOR OCEANIC SURVEILLANCE
Eric Deslauriers *In* AF Academy Proc. of the 1983 Symp. on Mil. Space Commun. and Operations 1983 p 109-113 (For primary document see N84-23809 14-32)
(AD-P002158) Avail: NTIS HC A07/MF A01 CSCL 22/2

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N84-23664*# RAND Corp., Santa Monica, Calif.
A DEVELOPMENT OF LOGISTICS MANAGEMENT MODELS FOR THE SPACE TRANSPORTATION SYSTEM Final Report
M. J. Carrillo, S. E. Jacobsen, J. B. Abell, and T. F. Lippiatt Sep. 1983 98 p refs
(Contract NAS10-10438)
(NASA-CR-173504; NAS 1.26:173504; R-3083-NASA; ISBN-0-8330-0529-4) Avail: NTIS HC A05/MF A01 CSCL 22A

A new analytic queueing approach was described which relates stockage levels, repair level decisions, and the project network schedule of prelaunch operations directly to the probability distribution of the space transportation system launch delay. Finite source population and limited repair capability were additional factors included in this logistics management model developed specifically for STS maintenance requirements. Data presently available to support logistics decisions were based on a comparability study of heavy aircraft components. A two-phase program is recommended by which NASA would implement an integrated data collection system, assemble logistics data from previous STS flights, revise extant logistics planning and resource requirement parameters using Bayes-Lin techniques, and adjust for uncertainty surrounding logistics systems performance parameters. The implementation of these recommendations can be expected to deliver more cost-effective logistics support. R.S.F.

N84-23665*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ADVANCED LEADING EDGE THERMAL-STRUCTURE CONCEPT. DIRECT BOND REUSABLE SURFACE INSULATION TO A COMPOSITE STRUCTURE
S. R. Riccitiello, Hector Figueroa (Aerospace Corp., Sunnyvale, Calif.), C. F. Coe (Coe Engineering), and C. P. Kuo (JPL) Mar. 1984 39 p refs
(NASA-TM-85941; A-9570; NAS 1.15:85941) Avail: NTIS HC A03/MF A01 CSCL 22B

An advanced leading-edge concept was analyzed using the space shuttle leading edge system as a reference model. The comparison indicates that a direct-bond system utilizing a high temperature (2700 F) fibrous refractory composite insulation tile bonded to a high temperature (PI/graphite) composite structure can result in a weight savings of up to 800 lb. The concern that tile damage or loss during ascent would result in adverse entry aerodynamics if a leading edge tile system were used is addressed. It was found from experiment that missing tiles (as many as 22) on the leading edge would not significantly affect the basic force-and-moment aerodynamic coefficients. Additionally, this concept affords a degree of redundancy to a thermal protection system in that the base structure (being a composite material) ablates and neither melts nor burns through when subjected to entry heating in the event tiles are actually lost or damaged during ascent. A.R.H.

N84-23666*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DEVELOPMENT OF BASELINE RANDOM VIBRATION ENVIRONMENT CRITERIA FOR SHUTTLE PALLET PAYLOAD SUBSYSTEMS
Frank J. On Apr. 1984 126 p refs Previously announced in IAA as A84-10955
(NASA-TM-86087; NAS 1.15:86087) Avail: NTIS HC A07/MF A01 CSCL 22B

This paper presents a statistical evaluation of measured random vibration response data obtained from the Office of Space Science-1 (OSS-1) pallet payload. The data were measured during the acoustic test simulation (September 1980) and the ascent phase of the flight of STS-3, Orbiter 102 (launched from the

Kennedy Space Center on March 22, 1982). Acoustic test efficiency factors are evaluated based on the Dynamic, Acoustic and Thermal Environments (DATE) instrumentation as the source of the measured vibration data. Test efficiency correction to test data is applied in the extrapolation of non-DATE acoustic test data to increase sample population size for improved statistical evaluation. For baseline criteria evaluation and development, data are grouped in accordance with the payload zone in which the component is mounted. F.J.O. (IAA)

N84-23667*# TRW Space Technology Labs., Redondo Beach, Calif.
PRELIMINARY DESIGN OF TWO SPACE SHUTTLE FLUID PHYSICS EXPERIMENTS Final Report
N. Gat and J. L. Kropp May 1984 225 p
(Contract NAS3-23774)
(NASA-CR-174649; NAS 1.26:174649; Rept-41763-6001-UT-00) Avail: NTIS HC A10/MF A01 CSCL 22A

The mid-deck lockers of the STS and the requirements for operating an experiment in this region are described. The design of the surface tension induced convection and the free surface phenomenon experiments use a two locker volume with an experiment unique structure as a housing. A manual mode is developed for the Surface Tension Induced Convection experiment. The fluid is maintained in an accumulator pre-flight. To begin the experiment, a pressurized gas drives the fluid into the experiment container. The fluid is an inert silicone oil and the container material is selected to be comparable. A wound wire heater, located axisymmetrically above the fluid can deliver three wattages to a spot on the fluid surface. These wattages vary from 1-15 watts. Fluid flow is observed through the motion of particles in the fluid. A 5 mw He/Ne laser illuminates the container. Scattered light is recorded by a 35mm camera. The free surface phenomena experiment consists of a trapezoidal cell which is filled from the bottom. The fluid is photographed at high speed using a 35mm camera which incorporated the entire cell length in the field of view. The assembly can incorporate four cells in one flight. For each experiment, an electronics block diagram is provided. A control panel concept is given for the surface induced convection. Both experiments are within the mid-deck locker weight and c-g limits. A.R.H.

N84-23668*# National Aeronautics and Space Administration, Washington, D. C.
FUTURE SPACE TRANSPORT
S. D. Grishin and S. V. Chekalin Mar. 1984 46 p refs Transl. into ENGLISH of the book "Kosmicheskiy Transport Budushchevo" Moscow, Znaniye Press, 1983 p 1-59 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77554; NAS 1.15:77554) Avail: NTIS HC A03/MF A01 CSCL 22B

Prospects for the mastery of space and the basic problems which must be solved in developing systems for both manned and cargo spacecraft are examined. The achievements and flaws of rocket boosters are discussed as well as the use of reusable spacecraft. The need for orbiting satellite solar power plants and related astrionics for active control of large space structures for space stations and colonies in an age of space industrialization is demonstrated. Various forms of spacecraft propulsion are described including liquid propellant rocket engines, nuclear reactors, thermonuclear rocket engines, electrorocket engines, electromagnetic engines, magnetic gas dynamic generators, electromagnetic mass accelerators (rail guns), laser rocket engines, pulse nuclear rocket engines, ramjet thermonuclear rocket engines, and photon rockets. The possibilities of interstellar flight are assessed. A.R.H.

N84-23817# Rockwell International Corp., Houston, Tex.
MISSION OPERATIONS IMPACT OF SPECIFIC SHUTTLE VEHICLE IMPROVEMENTS
Raymond A. Randolph *In* AF Academy Proc. of the 1983 Symp. on Mil. Space Commun. and Operations 1983 p 59-63 refs (For primary document see N84-23809 14-32)
(AD-P002152) Avail: NTIS HC A07/MF A01 CSCL 22/2

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N84-23669# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
AUTONOMOUS NAVIGATION OF USAF SPACECRAFT Doctoral Thesis
J. R. Ferguson, Jr. Dec. 1983 221 p
(AD-A139173; AFIT/CI/NR-83-82D) Avail: NTIS HC A10/MF A01 CSCL 17/7

The U. S. Air Force is developing satellite-borne sensors to enable autonomous navigation of spacecraft in the near future. This study compares the observations from several medium-accuracy space sensors, such as the existing telescopic space sextant, with those of future matrix-type sensors. The large field of view of matrix sensors will allow them to determine the Earth horizon to approximately an order of magnitude better than current infrared sensors by observing atmospheric refraction of stellar light. This horizon determination will give the matrix sensors an accuracy of less than 1 km. The limiting factor in Earth-horizon determination is the modeling of atmospheric refraction effects. For high-accuracy requirements (100 meters or less), the Global Positioning System (GPS) offers the only near-term solution. A relative navigation technique using range and Doppler data is proposed for autonomous navigation of the GPS satellites. The navigation accuracy of this technique is evaluated by consider covariance analysis and by processing corrupted data through a reduced-order onboard Sequentially Partitioned Algorithm. The algorithm is stable and for the GPS system produces in-plane accuracy of 40 meters over twenty days. However, out-of-plane motion is shown to be unobservable in the GPS-to-GPS tracking mode, and errors of up to 1.5 km over 60 days are experienced. For this reason, a supplemental transmitter on the ground or in a different orbit is recommended. Author (GRA)

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N84-23670*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
CONCEPTUAL DESIGN STUDY. SCIENCE AND APPLICATIONS SPACE PLATFORM (SASP). FINAL BRIEFING Final Briefing Report
1980 161 p refs
(Contract NAS8-33592)
(NASA-CR-173520; NAS 1.26:173520; MDC-G9300) Avail: NTIS HC A08/MF A01 CSCL 22B

The modularity, shape, and size of the recommended platform concept offers a low investment, early option to demonstrate the system; flexibility to conservative growth; adaptability to great variety of multi or dedicated payload groups; and good dispersion and viewing freedom for payloads. Platform configuration effectively supports 80 to 85% of the NASA/OSS and OSTA

payloads. The subsystem approaches recommended are based on cost effective distribution of functions. B.G.

N84-23671*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
SECOND INTERIM BRIEFING (D3). EVOLUTIONARY SCIENCE AND APPLICATIONS SPACE PLATFORM. CHARACTERIZATION OF CONCEPTS, TASKS A AND B
Nov. 1981 192 p refs
(Contract NAS8-33592)
(NASA-CR-173521; NAS 1.26:173521; MDC-9744) Avail: NTIS HC A09/MF A01 CSCL 22B

The objectives were to define, evaluate, and select concepts for evolving a space station in conjunction with the Space Platform for NASA science, Applications, Technology and DOD; and a permanently manned presence in space early, with a maximum of existing technology. B.G.

N84-23672*# Boeing Aerospace Co., Seattle, Wash.
ADVANCED PLATFORM SYSTEMS TECHNOLOGY STUDY. VOLUME 2: TRADE STUDY AND TECHNOLOGY SELECTION Final Report, Jul. 1982 - Apr. 1983
Apr. 1983 181 p refs
(Contract NAS8-34893)
(NASA-CR-173522; NAS 1.26:173522; D180-27487-2-Vol-2) Avail: NTIS HC A09/MF A01 CSCL 22B

Three primary tasks were identified which include task 1-trade studies, task 2-trade study comparison and technology selection, and task 3-technology definition. Task 1 general objectives were to identify candidate technology trade areas, determine which areas have the highest potential payoff, define specific trades within the high payoff areas, and perform the trade studies. In order to satisfy these objectives, a structured, organized approach was employed. Candidate technology areas and specific trades were screened using consistent selection criteria and considering possible interrelationships. A data base comprising both manned and unmanned space platform documentation was used as a source of system and subsystem requirements. When requirements were not stated in the data base documentation, assumptions were made and recorded where necessary to characterize a particular spacecraft system. The requirements and assumptions were used together with the selection criteria to establish technology advancement goals and select trade studies. While both manned and unmanned platform data were used, the study was focused on the concept of an early manned space station. Author

N84-23673*# Boeing Aerospace Co., Seattle, Wash.
ADVANCED PLATFORM SYSTEMS TECHNOLOGY STUDY. VOLUME 3: SUPPORTING DATA Final Report, Jul. 1982 - Apr. 1983
Apr. 1983 303 p refs
(Contract NAS8-34893)
(NASA-CR-173523; NAS 1.26:173523; D180-27487-3-Vol-3) Avail: NTIS HC A14/MF A01 CSCL 22B

The overall study effort proceeded from the identification of 106 technology topics to the selection of 5 for detail trade studies. The technical issues and options were evaluated through the trade process. Finally, individual consideration was given to costs and benefits for the technologies identified for advancement. Eight priority technology items were identified for advancement. Supporting data generated during the trade selection and trade study process were presented. Space platform requirements, trade study and cost benefits analysis, and technology advancement planning are advanced. The structured approach used took advantage of a number of forms developed to ensure that a consistent approach was employed by each of the diverse specialists that participated. These forms were an intrinsic part of the study protocol. Author

N84-23674*# Boeing Aerospace Co., Seattle, Wash.
ADVANCED PLATFORM SYSTEMS TECHNOLOGY STUDY. VOLUME 4: TECHNOLOGY ADVANCEMENT PROGRAM PLAN Final Report, Jul. 1982 - Apr. 1983
Apr. 1983 85 p refs
(Contract NAS8-34893)
(NASA-CR-173524; NAS 1.26:173524; D180-27487-4) Avail: NTIS HC A05/MF A01 CSCL 22B

An overview study of the major technology definition tasks and subtasks along with their interfaces and interrelationships is presented. Although not specifically indicated in the diagram, iterations were required at many steps to finalize the results. The development of the integrated technology advancement plan was initiated by using the results of the previous two tasks, i.e., the trade studies and the preliminary cost and schedule estimates for the selected technologies. Descriptions for the development of each viable technology advancement was drawn from the trade studies. Additionally, a logic flow diagram depicting the steps in developing each technology element was developed along with descriptions for each of the major elements. Next, major elements of the logic flow diagrams were time phased, and that allowed the definition of a technology development schedule that was consistent with the space station program schedule when possible. Schedules show the major milestone including tests required as described in the logic flow diagrams. Author

N84-23675*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DECOUPLED CONTROL ANALYSIS OF A LARGE FLEXIBLE SPACE ANTENNA WITH LINEAR QUADRATIC REGULATOR COMPARISONS
John W. Young, Harold A. Hamer, and Katherine G. Johsnon May 1984 82 p
(NASA-TP-2293; ; L-15696; NAS 1.60:2293) Avail: NTIS HC A05/MF A01 CSCL 22B

A decoupled-control analysis was performed for a large flexible space antenna. Control involved commanding changes in the rigid-body modes or nulling disturbances in the flexible modes. The study provides parametric-type data which could be useful in the final design of a large space antenna control system. Results are presented to illustrate the effect on control requirements of (1) the number of modes controlled; (2) the number, type, and location of control actuators; and (3) variations in the closed-loop dynamics of the control system. Comparisons are given between the decoupled-control results and those obtained by using a linear quadratic regulator approach. Time history responses are presented to illustrate the effects of the control procedures. Author

N84-23676*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SHOCK RESPONSE SPECTRA VARIATIONAL ANALYSIS FOR PYROTECHNIC QUALIFICATION TESTING OF FLIGHT HARDWARE
James Lee Smith May 1984 15 p refs
(NASA-TP-2315; NAS 1.60:2315) Avail: NTIS HC A02/MF A01 CSCL 22B

Shock response spectra data from flight certification tests were analyzed to determine envelope variation with respect to mean values in each axis. An overall variation of + or - 8.61 dB or 169 percent exists for the data. This large variation may be attributed to one or more of the following: (1) Instrumentation problems may exist. (2) Variations in the source charge (blasting caps) such as shape or explosive load may exist. (3) Two blasting caps were used to excite the pyrotechnic plate tester. Delay time between charge firings may have varied. The cause or causes of the variations need to be identified and researched to prevent future pyroshock problems. Author

N84-23677*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
AUTOMATED RENDEZVOUS AND DOCKING: A PARAMETRIC STUDY
Richard Dabney May 1984 34 p refs
(NASA-TP-2314; NAS 1.60:2314) Avail: NTIS HC A03/MF A01 CSCL 22B

A technique for achieving autonomous rendezvous and docking of two orbiting space vehicles is described. Results of a digital computer simulation of the technique are presented and used to

evaluate its performance under a wide variety of conditions, including docking with tumbling spacecraft. The interrelationships between initial range, tumbling rates, fuel consumption, and time requirements are explored. Factors which limit performance are identified and beneficial modifications proposed. M.A.C.

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N84-23678# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md. Chemical Propulsion Information Agency.
THE 14TH JANNAF PLUME TECHNOLOGY MEETING, VOLUME 1
Debra Sue Eggleston, ed. 1983 136 p refs Meeting held in China Lake, Calif., 15-17 Nov. 1983 2 Vol.
(Contract N00024-83-C-5301)
(AD-A139654; CPIA-Publ-384-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 21/8

This volume of the proceedings contains only the unlimited distribution papers presented at the Joint Army-Navy-NASA-Air Force (JANNAF) 14th Plume Technology Meeting held at the Naval Weapons Center, China Lake, California on November 15 to 17, 1983. Papers on prediction of exhaust plume contamination of spacecraft surfaces, plume flowfield prediction, gun muzzle flowfield prediction, and exhaust plume radiation are included. For individual titles, see N84-23679 through N84-23689.

N84-23679*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MMH-NITRATE AND PLUME DEPOSITS FROM NTO/MMH ENGINES
E. A. Lawton and C. M. Moran *In* APL The 14th JANNAF Plume Technol. Meeting, Vol. 1 1983 p 1-9 refs (For primary document see N84-23678 14-20)
(Contract NAS7-918)
Avail: NTIS HC A07/MF A01 CSCL 21H

The chemical properties of MMH-nitrate were characterized with emphasis on its role in plume deposits. The data in the literature indicated that the plume deposits from NTO/MMH engines were essentially methylhydrazinium nitrate (MMH-nitrate). The chemical literature did not contain data on its properties. Therefore, MMH-nitrate was synthesized and attempts were to correlate its properties with the results found elsewhere. MMH-nitrate is a minor constituent of plume deposits from NTO/MMH engines, but its properties exert a dominant effect on the nature of the deposits. MMH-nitrate is an extremely hygroscopic white solid, melting at 38 to 41 C., which solvates readily and retains water and MMH hydrate tenaciously. The properties of MMH-nitrate measured include differential scanning calorimetry (DSC) and mass spectral data. These data, correlated with older literature, are discussed from the viewpoint of the mechanism of formation of the plume deposits. Author

N84-23680# Science Applications, Inc., Los Angeles, Calif.
APPLICATION OF THE CONTAM III COMPUTER MODEL TO THE PREDICTION OF HEATING, FORCES, AND CONTAMINATION ON A COMMUNICATIONS SATELLITE c15
R. J. Hoffman *In* APL The 14th JANNAF Plume Technol. Meeting, Vol. 1 1983 p 9-40 refs (For primary document see N84-23678 14-20)
Avail: NTIS HC A07/MF A01 CSCL 22/2

The CONTAM III computer model recently was applied to the design of the OLYMPUS (previously L-SAT) commercial communication satellite. Nearly the full range of CONTAM model capabilities were exercised during this application. Extensive use of the TPP subprogram resulted in the identification and quantification of unburned propellant droplets, unburned propellant vapor, and contaminant wall film, present in the exhaust plume of the R-4D-11 liquid apogee engine and R6C reaction control and translational bipropellant thrusters. The MULTRAN subprogram was used to define the high altitude multiphase nozzle and plume flowfield, including nozzle boundary layer expansion into the backflow region. Chemical kinetics were considered along streamlines. The resulting plume flowfield was sorted along streamlines and formatted to be compatible with both the NASA PLIMP code for the prediction of impingement heating, forces, and moments, and with the CONTAM III/SURFACE subprogram for the prediction of impingement flux, abrasion, deposition, and contaminant effects. Both BLIMP and CONTAM III/SURFACE were exercised. Author

N84-23681# Science Applications, Inc., Los Angeles, Calif.
CONTAM III PLUS: IMPROVED CONTAM III USABILITY
R. J. Hoffman *In* APL The 14th JANNAF Plume Technol. Meeting, Vol. 1 1983 p 41-46 refs (For primary document see N84-23678 14-20)
(Contract F04611-83-C-0029)
Avail: NTIS HC A07/MF A01 CSCL 21/8

The CONTAM III computer code for the analysis of high altitude rocket nozzle and exhaust plume flowfiels, and the prediction of plume contamination effects, is presently being modified to increase its usability. The modifications underway are discussed, the status of the code development summarized, and recent User Bulletins concerning use of the CONTAM III code were discussed. Author

N84-23682# Grumman Aerospace Corp., Bethpage, N.Y.
SOLID CARBON OXIDATION AND RADIATION IN EXHAUST PLUMES
R. Ambruso and M. Slack *In* APL The 14th JANNAF Plume Technol. Meeting, Vol. 1 1983 p 47-56 refs (For primary document see N84-23678 14-20)
Avail: NTIS HC A07/MF A01 CSCL 21/8

The persistence of carbon particles in a rocket or aircraft exhaust plume is governed by the heterogeneous oxidation rate, and this in turn determines the IR emission intensities from surviving particles. Literature on the heterogeneous carbon oxidation rate is reviewed and an equivalent pseudo-gas oxidation reaction and rate coefficient are developed specifically for use in plume fluid mechanics codes which treat only gas phase oxidation reactions (e.g., SPF). The rate coefficient k-1.5 x 10(6) T(1/2) 1/r exp(-39300/RT) cubic cm/mole is for the reaction Cs + O2 + CO2, where r is the carbon particle radius, is recommended for sea level exhaust plumes. Earlier rate data by Slack and by Wilson are critically reviewed. For a nominal tactical rocket motor whose exhaust initially contains 1% carbon, plume properties for a range of altitudes and thrust levels were computed. The impact of carbon oxidation on the IR signature is presented. Author

N84-23683# Aeronautical Research Associates of Princeton, Inc., N. J.
EXHAUST PLUME INDUCED FLUCTUATIONS IN THE INDEX OF REFRACTION AT OPTICAL WAVELENGTHS
R. W. McCullough and B. E. Pearce *In* APL The 14th JANNAF Plume Technol. Meeting, Vol. 1 1983 p 57-66 refs (For primary document see N84-23678 14-20)
Avail: NTIS HC A07/MF A01 CSCL 21/8

Modern weapon systems are becoming increasingly dependent upon electro-optical communication links. Turbulent flowfields can induce substantial degradation of optical propagation. The results

of calculations of the turbulence induced fluctuations in the index of refraction for both aircraft and missile exhaust plumes are presented. A second-order closure model is used to predict the fluctuations and correlations of temperature, CO2, and H2O in an aircraft exhaust plume. These correlations are used to compute the index of refraction structure constant, C(2)(subn), for optical wavelengths. This calculation is compared to a simpler formulation using the g-equation extension to the two-equation turbulence kinetic energy model currently utilized. Results are presented for the C(2)(subn) field in the plume of a typical modern fighter aircraft. In addition, C(2)(subn) obtained from the two equation model is presented for the plume of a small, solid propellant rocket. The effects of the turbulence induced index of refraction fluctuations on optical imaging, laser communications, and laser weaponry are briefly discussed. Author

N84-23684*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MULTIPLE POINT SOURCE MODEL FOR THREE DIMENSIONAL PLUME FLOW FIELDS
C. S. Guernsey *In* APL The 14th JANNAF Plume Technol. Meeting, Vol. 1 1983 p 67-76 refs (For primary document see N84-23678 14-20)
Avail: NTIS HC A07/MF A01 CSCL 21H

The Galileo spacecraft utilizes plume shields to protect contamination sensitive spacecraft surfaces from contaminants in the plumes of the bipropellant thrusters which are used for attitude control and trajectory correction maneuvers. The reexpansion of these plumes around the plume shields is analyzed using the direct simulation Monte Carlo method in three dimensional form. However, it was not feasible to extend these calculations to include interactions with contamination sensitive surfaces because of complex spacecraft geometry. Further, it would be extremely inefficient and unnecessary to utilize the direct simulation Monte Carlo method to analyze the essentially collisionless regions of the flow field. An analytical model, based on an ellipsoidal velocity distribution function, was developed which allows extrapolation of these plume flow fields while preserving most of the nonequilibrium phenomena predicted by the Monte Carlo computations. Specifically, continued species separation due to inertial nonequilibrium is treated in the collisionless regime by using kinetic data sampled for each species at the boundary of the Monte Carlo calculation. The result is a computationally tractable model for the far field which is incorporated into conventional plume impingement or contamination computer codes. Author

N84-23685*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
OPERATIONAL UPDATE TO THE RCS FLOW MODEL OF THE SPACE SHUTTLE ORBITER
John W. Alred *In* APL The 14th JANNAF Plume Technol. Meeting, Vol. 1 1983 p 77-86 refs (For primary document see N84-23678 14-20)
Avail: NTIS HC A07/MF A01 CSCL 21H

The flow field for the Reaction Control System (RCS) jets of the Space Shuttle Orbiter was calculated from the nozzle throat to the far-field region. The calculations involve the use of recently improved rocket engine nozzle/plume codes and the source flow analytic model. The flow solution is discussed and used to predict impingement forces and moments as experienced by the Space Shuttle Orbiter during on-orbit operations. The flow solution is also used to analyze forces and moments on a satellite during Orbiter proximity operations. The results of these two analyses are compared to flight data obtained from flights STS-6 and STS-7. The comparison shows good agreement between experimental values and the predicted values from the latest plume models. Author

N84-23686# Aeronautical Research Associates of Princeton, Inc., N. J.
AIRCRAFT EXHAUST PLUME SIGNATURE PREDICTIONS FOR NON-AXISYMMETRIC MULTIPLE ENGINE INSTALLATIONS **c07**
B. E. Pearce, R. W. McCullough, and R. D. Thorpe *In* APL The 14th JANNAF Plume Technol. Meeting, Vol. 1 1983 p 87-96 refs (For primary document see N84-23678 14-20)
Avail: NTIS HC A07/MF A01 CSCL 21E

The exhaust plume flowfields and infrared radiation in a mid-IR bandpass are calculated for a single axisymmetric jet, a 5:1 aspect ratio rectangular nozzle, and two side-by-side axisymmetric nozzles with plume exit conditions typical of an aircraft in subsonic flight at non-afterburning thrust. The emphasis is on illustrating the different spatial distributions of the radiance from these non-axisymmetric flows. A unique combination of a three dimensional flowfield code and a radiative transfer code were used for the predictions. Plume and nozzle hot parts radiance distributions, spectra, and intensities are compared. Predictions of spatially resolved signatures for non-axisymmetric plumes of this class are currently practical to make. Author

N84-23687# Calspan Advanced Technology Center, Buffalo, N.Y. Physical Sciences Dept.
MACH NUMBER AND DENSITY EFFECTS IN THE MIXING OF SUPERSONIC JETS **c02**
C. Padova, D. W. Boyer, and W. H. Wurster *In* APL The 14th JANNAF Plume Technol. Meeting, Vol. 1 1983 p 107-116 refs (For primary document see N84-23678 14-20)
(Contract F04611-80-C-0011)
Avail: NTIS HC A07/MF A01 CSCL 01/1

The results describe the turbulent mixing of coaxial supersonic jets for a variety of relative Mach numbers and density ratios. Jet Mach numbers of 2, 3 and 4 were obtained with interchangeable nozzles and a supply apparatus housed within the large-scale Calspan Ludwieg Tube wind tunnel. The jets were discharged either into an outer stream having a Mach number of 2 or into a quiescent ambient. Molecular weight and temperature of the inner jets were varied to provide ambient-to-jet density ratios ranging from 0.6 to 10. Detailed measurements of pressure, temperature and gas composition obtained at various axial distances from the exhaust plane were used to describe the trends in the supersonic mixing behavior when jet density and Mach number are varied. Author

N84-23688# Florida Univ., Gainesville. Dept. of Mechanical Engineering.
ULTRAVIOLET OH MISSIONS IN H/SUB 2-AIR DIFFUSION FLAMES **c25**
K. M. Pamidimukkala, P. F. Schippnick, D. B. Vaidya, and A. E. S. Green *In* APL The 14th JANNAF Plume Technol. Meeting, Vol. 1 1983 p 117-122 refs (For primary document see N84-23678 14-20)
Avail: NTIS HC A07/MF A01 CSCL 21/2

Spatial distributions of OH emissions in the middle ultraviolet are observed in a laboratory hydrogen-air diffusion flame using a high resolution spectrometer in combination with a 512 channel diode array detector. Temperature measurements are made using a thermocouple. Using current reaction rates and diffusion coefficients the spatial dependence of OH and other major species are calculated using a version of the BOAT code, which was adapted for subsonic flow. The experimental observations are compared with these predictions. By using both experiment and theory, the major features of a laboratory hydrogen-air diffusion flame can be modeled. This combination of techniques is also applicable to methane-air diffusion flames. Author

N84-23689# Chemical Dynamics Corp., Columbus, Ohio.
THEORETICAL PREDICTIONS OF EXCITATION CROSS SECTIONS FOR COLLISIONS OF HF, HCl, CO, H/SUB 2O, AND CO/SUB 2 WITH O(SUP 3P) **c72**
M. J. Redmon, B. C. Garrett, and L. T. Redmon *In* APL The 14th JANNAF Plume Technol. Meeting, Vol. 1 1983 p 123-129 refs (For primary document see N84-23678 14-20)
(Contract F04611-82-C-0041)
Avail: NTIS HC A07/MF A01 CSCL 20/8

The methodology of modern theoretical chemistry is applied to the prediction of excitation cross sections for a variety of plume

species colliding with atomic oxygen. The relative velocity range considered is 4 to 10 km/sec. Reported cross sections generally rise to values of from several tenths to several square angstroms at the highest velocities. Although accurate predictions of the cross sections are generally obtained for transitions involving only small changes of vibrational quantum number, estimates are available for cross sections for many energetically accessible processes.
Author

N84-23690*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DISCHARGES ON A NEGATIVELY BIASED SOLAR ARRAY IN A CHARGED PARTICLE ENVIRONMENT
David B. Snyder 1983 15 p refs Presented at the Environ. Interactions Conf., Colorado Springs, 4-6 Oct. 1983; sponsored by the Air Force and NASA
(NASA-TM-83644; E-2090; NAS 1.15:83644) Avail: NTIS HC A02/MF A01 CSCL 21H

The charging behavior of a negatively biased solar cell array when subjected to a charged particle environment is studied in the ion density range from 200 to 12 000 ions/sq cm with the applied bias range of -500 to -1400 V. The profile of the surface potentials across the array is related to the presence of discharges. At the low end of the ion density range the solar cell cover slides charge to from 0 to +5 volts independent of the applied voltage. No discharges are seen at bias voltages as large as -1400 V. At the higher ion densities the cover slide potential begins to fluctuate, and becomes significantly negative. Under these conditions discharges can occur. The threshold bias voltage for discharges decreases with increasing ion density. A condition for discharges emerging from the experimental observations is that the average coverslide potential must be more negative than -4 V. The observations presented suggest that the plasma potential near the array becomes negative before a discharge occurs. This suggests that discharges are driven by an instability in the plasma.
Author

N84-23691*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
GROUND CORRELATION INVESTIGATION OF THRUSTER SPACECRAFT INTERACTIONS TO BE MEASURED ON THE IAPS FLIGHT TEST
John L. Power 1984 36 p refs Proposed for presentation at the 17th Intern. Elec. Propulsion Conf., Tokyo, 28-31 May 1984; sponsored by AIAA, Japan Society for Aeronautical and Space Sciences and Deutsche Gesellschaft fuer Luft- und Raumfahrt
(NASA-TM-83598; E-2007; NAS 1.15:83598) Avail: NTIS HC A03/MF A01 CSCL 20H

Preliminary ground correlation testing has been conducted with an 8 cm mercury ion thruster and diagnostic instrumentation replicating to a large extent the IAPS flight test hardware, configuration, and electrical grounding/isolation. Thruster efflux deposition retained at 25 C was measured and characterized. Thruster ion efflux was characterized with retarding potential analyzers. Thruster-generated plasma currents, the spacecraft common (SCC) potential, and ambient plasma properties were evaluated with a spacecraft potential probe (SPP). All the measured thruster/spacecraft interactions or their IAPS measurements depend critically on the SCC potential, which can be controlled by a neutralizer ground switch and by the SPP operation. Author

N84-23692# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A STUDY ON THE PREDICTION OF THE STARTING TRANSIENT PROCESS OF SOLID PROPELLANT ROCKET MOTORS
T. C. Chien and H. C. Ho 22 Feb. 1984 16 p Transl. into ENGLISH from Yuhang Xuebao (China), no. 4, 1982 p 44-51
(AD-A139453; FTD-ID(RS)T-0069-84) Avail: NTIS HC A02/MF A01 CSCL 21/2

The interior ballistic model of the starting transient process of the solid propellant rocket motor was improved with the aim of ensuring better accordance with the actual working conditions in the motor. The numerical solution of the governing equations, pertaining to one-dimensional unsteady gas dynamics, utilizes an implicit finite-difference scheme combined with the method of characteristics. The computed pressure-time curve is in fair agreement with the experimentally measured one. It is evident from the results of computation that erosive burning is a main factor affecting the starting pressure-peak for a given propellant geometry, and the heat exchange between the combustion-gas and the solid propellant casts a great influence upon the processes of ignition-induction and flame-spreading. Moreover, the rate of pressure change also plays an important role in the phases of flame-spreading and chamber-filling, and should hence be accounted for in the prediction. The computation program presented should provide a general means for accurate prediction of the interior ballistic curve of starting transient process, as well as for the investigation of the influences on it of the various factors involved.
R.J.F.

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N84-23693*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
KINETICS OF CHROMIUM ION ABSORPTION BY CROSS-LINKED POLYACRYLATE FILMS
Charles E. May May 1984 17 p refs
(NASA-TM-83661; E-2105; NAS 1.15:83661) Avail: NTIS HC A02/MF A01 CSCL 11G

Three cross-linked ion exchange membranes were studied as to their ability to absorb chromium ion from aqueous chromium III nitrate solutions. Attention was given to the mechanism of absorption, composition of the absorbed product, and the chemical bonding. The membranes were: calcium polyacrylate, polyacrylic acid, and a copolymer of acrylic acid and vinyl alcohol. For the calcium polyacrylate and the copolymer, parabolic kinetics were observed, indicating the formation of a chromium polyacrylate phase as a coating on the membrane. The rate of absorption is controlled by the diffusion of the chromium ion through this coating. The product formed in the copolymer involves the formation of a coordination complex of a chromium ion with 6 carboxylic acid groups from the same molecule. The absorption of the chromium ion by the polyacrylic acid membranes appears to be more complicated, involving cross-linking. This is due to the coordination of the chromium ion with carboxylic acid groups from more than one polymer molecule. The absorption rate of the chromium ion by the calcium salt membrane was found to be more rapid than that by the free polyacrylic acid membrane.
Author

N84-23694# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
24 Apr. 1984 48 p refs Transl. into ENGLISH from various West European articles
(JPRS-WST-84-013) Avail: NTIS HC A03/MF A01

Various topics such as advanced materials manufacture and testing, biotechnology, factory automation, microelectronics, scientific and industry policy, and technology transfer are presented. The current status production plans, and manufacturing techniques for ceramics, composite materials and semiconductors is discussed. Subjects pertaining to industrial management and international industrial cooperation are included. For individual titles, see N84-23695 through N84-23696.

N84-23695# Joint Publications Research Service, Arlington, Va.
BRITAIN'S ICI DEVELOPS NEW EASY-TO-SHAPE COMPOSITES **c24**
Pierre Laperrousaz *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-013) 24 Apr. 1984 p 1-2 Transl. into ENGLISH from L'Usine Nouvelle (France), 2 Feb. 1984 p 59-60 (For primary document see N84-23694 14-23)
Avail: NTIS HC A03/MF A01

A heat resistant, thermosetting resin impregnated with continuous carbon fibers is described. The manufacturing techniques and uses of the Aromatic Polymer composites (APC-1) as well as the mechanical properties of the laminate are included. The thermoplastic resin is best suited for parts subjected to severe fatigue, creep, and delamination conditions. M.A.C.

N84-23696# Joint Publications Research Service, Arlington, Va.
SWEDISH ACTIVITIES IN NEW CERAMIC MATERIALS, PROCESSES c27
Leif Hermansson and Roger Carlsson *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-013) 24 Apr. 1984 p 3-7 refs Transl. into ENGLISH from Kem. Tidskr. (Sweden), Jan. 1984 p 37-38; 40; 42 (For primary document see N84-23694 14-23)
Avail: NTIS HC A03/MF A01

The development of ceramic construction materials is described. Emphasis is placed on manufacturing techniques such as sintering and injection molding as well as research management. A method for the removal of organic binding agents without causing surface defects on injection molded parts is included. M.A.C.

24 COMPOSITE MATERIALS

Includes laminates.

N84-23697*# Clemson Univ., S.C. Dept. of Mechanical Engineering.
SHEAR-LAG ANALYSIS OF NOTCHED LAMINATES WITH INTERLAMINAR DEBONDING Final Report
James G. Goree and Autar K. Kaw Washington NASA May 1984 46 p refs
(Grant NsG-1297)
(NASA-CR-3798; NAS 1.26:3798) Avail: NTIS HC A03/MF A01 CSCL 11D

The fracture behavior of a debonded zone of finite width with no longitudinal damage in the unidirectional ply is predicted and the solution is then extended to include longitudinal matrix yielding and splitting in the unidirectional ply at the crack tip. The shear-lag assumption is used to describe the shear transfer between fibers. The fracture behavior of the laminate is studied as a function of initial crack length, constraint ratio, and width of the debonded zone. Results indicate that debonding can reduce the maximum fiber stress at the crack tip on the order of ten percent. This effect is maximum for a debond width of two or three fiber spacings and is independent of the initial crack length. As the debond width grows beyond this point, the maximum stress increases. For widths of about ten fiber spacings or more, the maximum fiber stress is larger than for the fully bonded case. In the presence of longitudinal matrix damage the same general behavior is found; however, the location of the maximum fiber stress is quite complex. A.R.H.

N84-23698*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOLAR ABSORPTANCE AND THERMAL EMITTANCE OF SOME COMMON SPACECRAFT THERMAL-CONTROL COATINGS
John H. Henninger Apr. 1984 47 p refs
(NASA-RP-1121; ; Rept-84F0248; NAS 1.61:1121) Avail: NTIS HC A03/MF A01 CSCL 11D

Solar absorptance and thermal emittance of spacecraft materials are critical parameters in determining spacecraft temperature control. Because thickness, surface preparation, coatings formulation, manufacturing techniques, etc. affect these parameters, it is usually necessary to measure the absorptance and emittance of materials before they are used. Absorptance and emittance data for many common types of thermal control coatings, are together with some sample spectral data curves of absorptance. In some cases for which ultraviolet and particle radiation data are available, the degraded absorptance and emittance values are also listed. M.A.C.

N84-23699*# National Aeronautics and Space Administration, Washington, D. C.
GRAIN BOUNDARY ENGINEERING OF MECHANICAL STRENGTH OF SILICON NITRIDE (Si3N4)
A. Tsuge Apr. 1984 17 p refs Transl. into ENGLISH from Seramikkusu (Japan), v. 18, no. 3, 1983 p 205-210 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77433; NAS 1.15:77433) Avail: NTIS HC A02/MF A01 CSCL 11D

The technical control of grain boundaries of sintered Si3N4 in relation to its mechanical strength is described with special emphasis on the Si3N4-Y2O3-Al2O3 system. Author

N84-23700*# National Aeronautics and Space Administration, Washington, D. C.
STRENGTH EVALUATION TEST OF PRESSURELESS-SINTERED SILICON NITRIDE AT ROOM TEMPERATURE
K. Matsusue, K. Takahara, and R. Hashimoto Mar. 1984 23 p refs Transl. into ENGLISH of 'Johatsu Shohketsu Chikka Keisono Johatsu Kyodo Hyoka Shiken" rept. NAL-TR715 National Aerospace Lab., Tokyo, Jun. 1982 p 1-12 Original language document was announced as N83-17595 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77394; NAS 1.15:77394) Avail: NTIS HC A02/MF A01 CSCL 11D

In order to study strength characteristics at room temperature and the strength evaluating method of ceramic materials, the following tests were conducted on pressureless sintered silicon nitride specimens: bending tests, the three tensile tests of rectangular plates, holed plates, and notched plates, and spin tests of centrally holed disks. The relationship between the mean strength of specimens and the effective volume of specimens are examined using Weibull's theory. The effect of surface grinding on the strength of specimens is discussed. Author

N84-23701# Virginia Polytechnic Inst. and State Univ., Blacksburg.
ASSESSMENT OF MICRODAMAGE DEVELOPMENT DURING TENSILE LOADING OF GRAPHITE/EPOXY LAMINATES Final Report, 1 Sep. 1982 - 30 Nov. 1983
R. D. Jamison and K. L. Reifsnider Jan. 1984 101 p
(Contract DAAG29-82-K-0190)
(AD-A139128; ARO-19913.1-MS-A) Avail: NTIS HC A06/MF A01 CSCL 11/4

The present work examines in a systematic way the development of microdamage in several laminates of graphite/epoxy material during quasi-static tensile loading. Emphasis is placed upon discriminating and quantifying matrix and fiber damage. Penetrant-enhanced X-ray radiography and edge replication were used to map the progression of matrix damage. The recently developed technique of specimen deply was used to follow the progression of fiber fracture. By complementary application of these destructive and nondestructive techniques a more complete and coherent picture of microdamage was developed. GRA

N84-23702# Naval Research Lab., Washington, D. C.
HIGH PERFORMANCE COMPOSITES AND ADHESIVES FOR V/STOL AIRCRAFT Final Report
C. F. Poranski, Jr. 22 Feb. 1984 103 p
(F54-502)
(AD-A139168; NRL-MR-5231) Avail: NTIS HC A06/MF A01 CSCL 11/4

This is the final report a NAVAIR sponsored program addressing aspects of the composite and adhesive materials requirements of V/STOL aircraft. The primary tasks were to develop and characterize high modulus, high toughness resins with use temperatures of 350 F to 450 F or higher; to develop graphite fiber reinforced composite fabrication technology for newly developed resin matrices; to develop failure criteria for composite design optimization; and to establish appropriate quality control parameters. During the course of the program a variety of matrix materials and adhesives were studied in the various tasks. Three

matrix materials were picked for a detailed study on the basis of performance and processing characteristics. They are NRL C10-diamide, Narmco 5208 epoxy and Hexcel F-178 bis-maleimide. Composites made from T-300 graphite fiber formed the key test set in the Failure Analysis Task. Detailed chemical and thermochemical characterization was carried out on these resins to provide a data base for developing quality assurance procedures. This report covers the final phase of the program. GRA

N84-23703# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
EXPERIMENTAL MEASUREMENT OF MATERIAL DAMPING FOR SPACE STRUCTURES IN SIMULATED ZERO-g M.S. Thesis
R. L. Sheen Dec. 1983 120 p
(AD-A139215; AFIT/CI/NR-83-84T) Avail: NTIS HC A06/MF A01 CSCL 11/4

An experimental apparatus for measuring the material damping properties of a beam specimen is described. The apparatus, called Tuneable Excitation Launch Mechanism (TELM) measures the free decay of free-free beams launched into free-fall in a vacuum. Aluminum 2024-T3 specimens are tested with results following the Zener model for specimens with a fundamental free-free frequency above the relaxation frequency. However, specimens with a fundamental free-free frequency below the relaxation frequency show a high degree of stress dependence. Frequency range was 17 Hz to 358 Hz and stress range was 0.5 KSI to 17 KSI. Graphite/epoxy ASI/3501-6 laminates were also tested. For (o) sub 8 laminates, material damping ratio of approximately .000555 was found for frequencies varying from 45 Hz to 237 Hz. The damping was neither stress on frequency dependent. For (90 sub 8) laminates, the damping ratio ranged from .0055 to .0066 as frequency ranged from 42 Hz to 143 Hz. Damping ratios for (90 sub 8) specimens with graphite fibers, magnesium matrix, and either titanium or magnesium foil were also tested. Damping ratios ranged from .00039 to .00099 depending upon the lay up, frequency, and possibly the stress range involved. Author (GRA)

N84-23704# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
FATIGUE DAMAGE - STRENGTH RELATIONSHIPS IN COMPOSITE LAMINATES, VOLUME 2 Final Report, Dec. 1982 - Apr. 1983
K. L. Reifsnider and W. W. Stinchcomb Wright-Patterson AFB, Ohio AFWAL 15 Jan. 1984 56 p 2 Vol.
(Contract F33615-81-K-3225; AF Proj. 2307)
(AD-A139241; AFWAL-TR-83-3084-Vol-2) Avail: NTIS HC A04/MF A01 CSCL 11/4

This report presents information and experience generated during the subject investigation which provided support for the major thrust of the effort, but was not the eventual focus of the program. The activities are discussed in the context of the various experimental techniques used (and developed) to investigate fracture-related damage development. While much of the information discussed is not complete, it is thought that a description of the experimental methods and experiences will be valuable to the technical community. Included are descriptions of virtually every experimental technique used in this program and a variety of findings not discussed elsewhere. Author (GRA)

N84-23705# Texas Univ., Austin. Center for Materials Science and Engineering.
MICROSCOPIC STUDY OF THE INFLUENCE OF IMPURITIES ON INTERFACE BONDING Annual Technical Report, 1 Dec. 1982 - 30 Nov. 1983
H. L. Marcus 25 Jan. 1984 45 p
(Contract N00014-83-K-0143)
(AD-A139300; UTCMSE-84-1) Avail: NTIS HC A03/MF A01 CSCL 11/4

Results are reported for two experimental areas associated with interface failure. Model layered systems, with the main emphasis on the Al-Al2O3-Graphite system, were studied for varied interface chemistry and thickness. The results show that when the interface has low resistivity fracture occurs within the graphite but when the interface resistance is high fracture occurs within the interface. This holds true for a wide range of interface chemistries and impurity doping at the interface. Introduction of an embrittling element at the interface of the low resistance interface did not change the fracture path. The second experimental area studied was the influence the interface plays on the fracture behavior of the discontinuous SiC/Al matrix composites. Both discontinuous fibers and particulate SiC dispersoids were studied. In all cases interface failure was not the dominant fracture path. The more ductile the matrix the more ductile the composite and the less interface failure. Gamma-Al2O3 was observed to be present at many of the interfaces. Author (GRA)

N84-23706# Drexel Univ., Philadelphia, Pa. Dept. of Mechanical Engineering and Mechanics.
FRACTURE MECHANICS OF SUBLAMINATE CRACKS IN COMPOSITE LAMINATES Interim Report, Oct. 1982 - Feb. 1983
A. S. D. Wang Feb. 1983 69 p Presented at the AGARD Struct. and Mater. Specialists Meetings, England, 10 - 15 Apr. 1983
(Contract F49620-79-C-0206; AF Proj. 2307)
(AD-A139357; AFOSR-84-0168TR) Avail: NTIS HC A04/MF A01 CSCL 11/4

This paper presents an overview of a fracture mechanics approach to some of the most frequently encountered matrix-dominated, sub-laminate cracks in epoxy-based composite laminates. By sub-laminate, it is meant that the cracks are internal to the laminate, generally invisible macroscopically; but are much larger in size than those microcracks considered in the realm of micromechanics. The origin of sub-laminate cracks is assumed to stem from the coalescence of natural flaws (also microcracks) which occur under a certain favorable laminate stress condition. Thus, the modelling of the mechanisms of sub-laminate crack initiation and propagation is essentially mechanistic and probabilistic in nature. Some specific results form several analytical/experimental investigations using graphite-epoxy laminates are presented and discussed in this paper. Author (GRA)

N84-23707# Sandia Labs., Albuquerque, N. Mex.
THICK-WALL KEVLAR 49/EPOXY PRESSURE VESSELS
T. R. Guess 1984 34 p refs Presented at the 29th Natl. SAMPE Symp., Reno, Nev., 3 Apr. 1984
(Contract DE-AC04-76DP-00789)
(DE84-003102; SAND-83-1356C; CONF-840459-1) Avail: NTIS HC A03/MF A01

Prototype vessels, in both spherical and cylindrical geometries, were designed, fabricated and burst tested. Experimental burst pressures are in excellent agreement with predicted values for burst pressures up to 60 ksi. Each unit consisted of a thin, seamless, copper liner with stainless steel fill stems and a filament-wound Kevlar 49/epoxy outer shell. Analysis of vessel performance accounted for liner thickness and yield strengths, composite thickness, mechanical properties and fiber volume fraction, and stress concentrations caused by the fill stem. Spherical vessels with inside diameters of 2.15 inches, 4.0 inches and 5.3 inches, with either 30 ksi or 60 ksi design burst pressure, are discussed. Cylindrical vessels with identical liners but of two different composite thicknesses achieved 50 ksi and 57 ksi burst pressures, respectively. Design considerations, the stress state in a thin metal liner during cyclic loading, and the life prediction of composite vessels under sustained loading are discussed. DOE

N84-23708# Sandia Labs., Albuquerque, N. Mex.
MECHANICAL BEHAVIOR OF SURFACE AMINATED POLYARAMID FABRIC/EPOXY COMPOSITES
R. E. Allred 1984 11 p refs Presented at 29th Natl. SAMPE Symp., Reno, Nev., 3 Apr. 1984
(Contract DE-AC04-76DP-00789)
(DE84-006230; SAND-83-1686C) Avail: NTIS HC A02/MF A01

This study compares the mechanical behavior of aminated Kevlar 49 polyaramid fabric/DER 332-MPDA laminates with

laminates fabricated with untreated polyaramid filaments. Interface-sensitive tests show that interface-dominated properties are increased by the amination. Peel resistance increases > 100% while + or - 45(0) tensile shear yield increased 30 to 40%. Examination of the transverse tensile fracture surfaces showed that the failure mode changed from an interface-dominated one to a mixture of filament splitting and matrix cracking in the aminated laminates. These results show that the mechanical properties of polyaramid/epoxy laminates may be improved by the formation of covalent bonds at the filament-matrix interface. It is expected that environmental resistance would also be improved. DOE

N84-23709# Bendix Corp., Kansas City, Mo.
SHELF LIFE DETERMINATION OF AN EPOXY RESIN BY ACCELERATED AGING
H. M. Smith Nov. 1983 17 p Presented at the 1984 Ann. Tech. Conf. and Exhibit of the Society of Plastics Engineers, Inc., New Orleans, 30 Apr. - 3 May 1984
(Contract DE-AC04-76DP-00656)
(DE84-006048; BDX-613-2973; CONF-840474-2) Avail: NTIS HC A02/MF A01

The rate and mode of degradation of an epoxy resin at two storage conditions, 4.4(0)C and 25(0)C, was defined by a thermally accelerated aging experiment. Then, samples which had been aged the equivalent of at least 10 years at each storage condition would be tested for conformity to the material specifications. It is demonstrated that the commercial resin could be acquired and stored for the required 10 to 11 years without concern over degradation. The expected changes at the two storage temperatures are defined. It is shown that aged resin samples yield an acceptable product. The changes in viscosity and epoxide equivalent of the resin at any other storage temperature are predicted. DOE

N84-23710# North Carolina Agricultural and Technical State Univ., Greensboro. Dept. of Mechanical Engineering.
EFFECT OF FATIGUE AND THERMAL LOADS ON SILICON CARBON FIBER REINFORCED GLASS MATRIX COMPOSITES Progress Report, 15 Aug. 1984 - 31 Jan. 1984
V. S. Avva and J. Sankar 8 Feb. 1984 4 p
(Contract DE-AS05-83ER-45045)
(DE84-007464; DOE/ER-45045/1) Avail: NTIS HC A02/MF A01

Specimen acquisition, a specimen gripping device, a high-temperature furnace, and scheduled research efforts are noted. DOE

N84-23695# Joint Publications Research Service, Arlington, Va.
BRITAIN'S ICI DEVELOPS NEW EASY-TO-SHAPE COMPOSITES
Pierre Laperrousaz *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-013) 24 Apr. 1984 p 1-2 Transl. into ENGLISH from L'Usine Nouvelle (France), 2 Feb. 1984 p 59-60 (For primary document see N84-23694 14-23)
Avail: NTIS HC A03/MF A01

N84-23904*# Royal Aircraft Establishment, Farnborough (England).
COMPOSITES FOR INCREASED WEAR RESISTANCE: CURRENT ACHIEVEMENTS AND FUTURE PROSPECTS
J. K. Lancaster *In* NASA Lewis Research Center Tribology in the 80's. Vol. 1 Apr. 1984 p 333-356 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01 CSCL 11D

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N84-23711*# National Aeronautics and Space Administration, Washington, D. C.
RHEOLOGICAL STUDY OF CLAY-KAOLIN AQUEOUS SUSPENSIONS
R. Lapasin and F. Lucchini Mar. 1984 17 p refs Transl. into ENGLISH from Ceramurgia (Italy), v. 11, no. 2, 1981 p 57-61 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77363; NAS 1.15:77363) Avail: NTIS HC A02/MF A01 CSCL 07D

Rheological characteristics of clay-kaolin aqueous suspensions were studied by a rotational viscometer to correlate their behavior with the properties of ceramic slips for casting containing quartz, feldspars, and other nonplastic materials. In particular, the effects of the different amounts of dry materials and deflocculant (mixture 1:1 of Na2CO3 and Na2SiO3) and of temperatures on the shear-time-dependent properties of suspensions were examined. Author

N84-23712*# National Aeronautics and Space Administration, Washington, D. C.
DEFLOCCULATION OF CLAY SUSPENSIONS USING SODIUM POLYACRYLATES
Pavel Jedlicka Mar. 1984 17 p refs Transl. into ENGLISH from Sklar a Keramik (Czechoslovakia), v. 33, no. 3, 1983 p 65-69 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77432; NAS 1.15:77432) Avail: NTIS HC A02/MF A01 CSCL 07D

Rheological properties of elutriated kaolin suspensions deflocculated by Na polyacrylate (DAC 3 and DAC 4) were studied and compared to those deflocculated by the conventional Na2CO3 water and glass and imported Dispex N40. The deflocculating effect of Na polyacrylate was comparable to that of Dispex N40. The optimum amounts of Na polyacrylate were determined for suspensions based on 5-type kaolin. The Na polyacrylate can be successfully used for decreasing the water content of ceramic slips for casting and spray drying. Author

N84-23713# New York Univ., New York. Dept. of Chemistry.
DISPERSION SPECTROSCOPY OF OPTICAL ELECTRON TRANSFER IN SOLUTION
P. Delahay and A. Dziedzic Feb. 1984 36 p
(Contract N00014-82-K-0113)
(AD-A139101; NYU/DC/TR-3-NEW-SERIES-2) Avail: NTIS HC A03/MF A01 CSCL 07/4

The effect of dielectric dispersion of the solvent on optical electron transfer is interpreted as a shift delta G sub d of the free energy level of the ground state in the photoionization process. The shift delta G sub d is derived for transparent and absorbing solvents by application of the Marcus theory of nonequilibrium polarization of a continuous medium. Only the inner-sphere solvation shell contributes significantly to the dispersion correction delta G sub d. Application is made to photoelectric emission by solutions. The effect of dispersion on the energetics of emission causes deviation from the expected emission law. The resulting dispersion spectra are obtained for photoelectron emission by 17 inorganic anions in aqueous solution in the 7 to 10 eV range of photon energies. The spectra primarily result from dispersion of the solvent and are not strongly affected by the nature of the photoionized anion. Experimental dispersion spectra agree well with the theoretical spectrum predicted from the real and imaginary dielectric constants obtained from reflectance spectroscopy data of liquid water. Dispersion spectroscopy of optical electron transfer developed in this work provides an experimental probe of the inner-sphere solvation shell. Author (GRA)

N84-23714# Rocketdyne, Canoga Park, Calif.
INORGANIC HALOGEN OXIDIZERS Final Report, 1 Mar. 1982 - 31 Dec. 1983
K. O. Christe 22 Feb. 1984 223 p
(Contracts N00014-82-C-0414; MIPR-105-83)
(AD-A139127; RI/RD84-126; ARO-17386.31-CH) Avail: NTIS

HC A10/MF A01 CSCL 07/2

A basic research program was carried out in the area of inorganic halogen oxidizers. The main effort was directed towards the synthesis and characterization of ClF6(+) salts. Pure ClF6(+) salts were prepared for the first time and shown to be of excellent kinetic stability. Methods developed for NF4(+) chemistry were successfully transferred to ClF6(+) chemistry, and ClF6SbF6, ClF6AsF6 and ClF6BF4 were prepared and characterized. By analogy with NF4ClO4, ClF6ClO4 was found to be unstable. The relative oxidizing power of KrF(+), PtF6, and F2 in the presence of a strong Lewis acid and an activation energy source was studied and found to decrease in this order. Numerous new NF4 salts were prepared and characterized. Attempts to prepare substituted NF4(+) salts were unsuccessful. The first known example of a metal hypofluorite, TeF5OF, was prepared (-) and characterized. Attempts conducted on the synthesis of ClF4OF from ClF4O and FOSO2F were unsuccessful, but resulted in an unusual oxygen abstraction reaction. The O2F radical was prepared and subsequently characterized by laser magnetic resonance spectroscopy. The structures of the NF3(+) radical cation and of the SF4 and SF4O radical anions were studied by ESR spectroscopy. The gas phase structure of CF3N3 was investigated by electron diffraction and microwave spectroscopy. GRA

N84-23715# State Univ. of New York, Buffalo. Dept. of Chemistry.

ELECTROCHEMICAL AND SPECTROSCOPIC STUDIES OF POLYPYRIDINE COMPLEXES OF Fe(2)/(3) AND Ru(2)/(3) IN THE ALUMINUM CHLORIDE: N-(1-BUTYL)PYRIDINIUM CHLORIDE MOLTEN SALT

S. Sahami and R. A. Osteryoung Jan. 1984 49 p
(Contract N00014-79-C-0682)
(AD-A139170; SUNYBUF/DC/TR-18) Avail: NTIS
HC A03/MF A01 CSCL 07/4

The electrochemical and spectroscopic behavior of Fe(bpy)3(2+), Fe(phen)3(2+) and Ru(bpy)3(2+) in an ambient-temperature molten salt system, aluminum chloride:N-(l-butyl) pyridinium chloride (BuPyCl) have been studied as a function of melt composition. The complexes show a single one-electron reversible oxidation wave from melt compositions of 1:1 to 2:1 (AlCl3:BuPyCl mole ratio). Visible spectroscopic and electrochemical data indicate that these compounds are stable in the neutral (1:1) and acid (mole ratio greater than 1) melts, while Ru(bpy)3(2+) is stable in basic melts (mole ratio less than 1), but Fe(bpy)3(2+) and Fe(phen)3(2+) decompose to FeCl4(2-). Comparison of the formal potentials for M(III)/(II)-polypyridine couples studied here and in other solvents indicate that the redox properties of these complexes are relatively insensitive to the nature of the solvent. It was shown that oxygen acts as an oxidant in the acid melts to oxidize Fe(bpy)3(2+), Fe(phen)3(2+) and Ru(bpy)3(2+) to their corresponding 3+ form. The 3+ form of each complex was stable in acid melts for several weeks. Perchlorate is also shown to function as an oxidant in acidic melts. Author (GRA)

N84-23716# State Univ. of New York, Buffalo. Dept. of Chemistry.

ELECTROCHEMICAL POLYMERIZATION OF PYRROLE AND ELECTROCHEMISTRY OF POLYPYRROLE FILMS IN AMBIENT TEMPERATURE MOLTEN SALTS

P. G. Pickup and R. A. Osteryoung Jan. 1984 24 p
(Contract N00014-79-C-0682)
(AD-A139174; SUNYBUF/DC/TR-16) Avail: NTIS
HC A03/MF A01 CSCL 07/4

Oxidative electrochemical polymerization of pyrrole has been shown to occur in the 1:1 mole ratio AlCl3:N-(l-butyl)pyridinium chloride((BuPyCl) molten salt at 40 C. Polypyrrole cannot be prepared in analogous 0.8:1 (basic) or 1.2:1 (acidic)) mole ratio melts. The polypyrrole prepared in the molten salt is electrochemically similar to polypyrrole prepared in acetonitrile; both materials are conductors when oxidized, can be used as electrode materials for the electrochemistry of solution species (e.g., ferrocene) and are oxidized and reduced at ca. -200 mV vs SSCE in CH3CN. The cyclic voltammetry of materials prepared in both CH3CN and in the neutral melt has been investigated in the AlCl3:BuPyCl molten salt system and in CH3CN. The most significant differences appear in the kinetics of the redox chemistry. The most facile behavior was observed in a 0.8:1 melt with polypyrrole prepared in the 1:1 melt. Author (GRA)

N84-23717# State Univ. of New York, Buffalo. Dept. of Chemistry.

INCREASED ELECTROCHEMICAL WINDOW IN AMBIENT TEMPERATURE NEUTRAL IONIC LIQUIDS

M. Lipsztajn and R. A. Osteryoung Jan. 1984 12 p
(Contract N00014-79-C-0682)
(AD-A139194; SUNYBUF/DC/TR-15) Avail: NTIS
HC A02/MF A01 CSCL 07/4

A neutral melt of exactly 1.0:1.0 mole composition of AlCl3:RC1, where R(+) is either N-(1-butyl) pyridinium or 1-methyl-3-ethyl imidazolium, has been shown to have an increased electromechanical window of 3.5 an 4.5 V, respectively. System characteristics are described. GRA

N84-23718# State Univ. of New York, Buffalo. Dept. of Chemistry.

CATHODIC STRIPPING VOLTAMMETRY OF THIOAMIDES ON A ROTATING SILVER DISK ELECTRODE

M. Iwamoto and R. A. Osteryoung Jan. 1984 43 p
(Contract N00014-79-C-0682)
(AD-A139200; SUNYBUF/DC/TR-17) Avail: NTIS
HC A03/MF A01 CSCL 07/4

Cathodic stripping voltammetry at a rotating silver disc electrode has been applied for the determination of five thioamides; thioacetamide (TAA), thiourea (TU), thionicotinamide (TNA), ethionamide (ETNA), and thiosemicarbazide (TSC). Well defined oxidation waves limited by convective diffusion were found at -0.29, -0.12, -0.27, -0.15 and -0.105 V vs SCE for the five amides in a pH 9.2 borate buffer. Stripping peaks appeared at approx. -0.76 V vs SCE, approximately identical to that for S superscript 2-, which, however, produces an oxidation wave at -0.66 V vs SCE. It is suggested that the insoluble compounds formed in the electrode surface are converted to Ag2S. Linear cathodic stripping peak currents were found over a concentration range of approx. .0000001 M to .00001 M. Author (GRA)

N84-23719# Indiana Univ., Bloomington. Dept. of Chemistry.

A NEW METHOD FOR OBTAINING INDIVIDUAL COMPONENT SPECTRA FROM THOSE OF COMPLEX MIXTURES Interim Technical Report

D. E. Honigs and G. M. Hieftje 10 Mar. 1984 28 p
(Contract N00014-76-C-0838)
(AD-A139262; INDU/DC/GMH/TR-84-62; TR-71) Avail: NTIS
HC A03/MF A01 CSCL 07/4

In Near-Infrared Reflectance Analysis (NIRA), a computer is trained to recognize and quantitate the relationship between the near-infrared spectrum of a sample and the concentrations of one or more of the sample constituents. During this training process the computer implicitly generates the spectrum of the constituents in question although this spectrum is ordinarily not available for operator inspection. In the present study, a method for displaying this implicit information is developed and evaluated. The resulting reconstructed spectrum can be of a specific chemical constituent in a sample or can be a composite spectrum of those components that collectively contribute to specific sample properties such as material strength, processing temperature or to sensory characteristics such as the hotness of peppers. A comparison is made of this new spectral reconstruction technique to established methods such as spectral stripping and factor analysis. Author (GRA)

N84-23720# Hughes Aircraft Co., El Segundo, Calif.

CHEMISTRY OF PROCESSIBLE ACETYLENE-TERMINATED IMIDES Final Report, 1 Apr. 1982 - 1 Apr. 1983

A. L. Landis Wright-Patterson AFB, Ohio AFWAL Aug. 1983 53 p
(Contract F33615-82-C-5016; AF Proj. ILIR)

(AD-A139417; HAC-FR-83-76-725; AFWAL-TR-83-4079) Avail: NTIS HC A04/MF A01 CSCL 11/9

Improved chemistry was explored for the formation of acetylene terminated isoimide resins of varying lengths. The resins were prepared by forming an amic acid precursor from benzophenone tetracarboxylic acid dianhydride, 1,3 - bis (3-aminophenoxy) benzene and 3-aminophenylacetylene followed by cyclodehydration by N,N'-dicyclohexylcarbodi-imide. A Fourier Transform infrared analysis method was devised to quantitatively determine the amounts of isoimide, imide, and amic acid present in the resins. The optimized chemistry was then applied successfully to the preparation of a series of lower cost acetylene terminated isoimides by substitution of 4,4'-oxydianiline for the 1,3-bis (3-aminophenoxy) benzene. The resultant resins were found to be curable at 316 C to crosslinked imides with Tg values in excess of 316 C for oligomer lengths of 1, 2 and 3. Thermal and mechanical studies were carried out on all of the resins. Author (GRA)

N84-23721# Naval Weapons Center, China Lake, Calif.
ELECTROCHEMICAL REDUCTION REACTIONS INVOLVING FORMIC ACID
M. H. Miles, A. N. Fletcher, and G. E. McManis 8 Mar. 1984 24 p
(RR0-1309; RR0-1411)
(AD-A139479; TR-1) Avail: NTIS HC A02/MF A01 CSCL 07/4

Various investigators have shown that the electrode reduction of CO2 in water using metal electrodes yields acid as the main product. Recent publications have generated conflicting claims regarding the further reduction of formic acid to methanol. Our studies using platinum electrodes at a fixed pH in mildly acidic NaCl04 solutions show an increase in the cathodic current when NaCOOH is added. Closer examinations show that the HCOOH/HCOO equilibrium is involved and that H3O(+) rather than HCOOH is reduced. The results of these investigations can be represented by a reaction sequence where the net result is the reduction of protons present as either undissociated HCOOH or HcO(+) to form hydrogen gas. The positively charged protons complexed with one or more water molecules are electrochemically reduced at a more positive potential than neutral water molecules. GRA

N84-23722# United Technologies Research Center, East Hartford, Conn.
A STUDY OF ADHERENT OXIDE FORMATION Annual Technical Report, Jul. 1982 - Sep. 1983
A. W. Funkenbusch and J. G. Smeggil Oct. 1983 81 p
(Contract N00014-82-C-0618)
(AD-A139505; UTRC/R83-916154-1) Avail: NTIS HC A05/MF A01 CSCL 07/2

The effects by which minor element additives (yttrium and hafnium) and laser surface melting and rapid solidification (laser-processing) improve oxide scale adherence to NiCrAl were investigated. Laser-processed materials were isothermally and cyclically oxidized and oxide scale structure and adherence were examined. Laser-processing promoted thin, dense oxide formation in yttrium doped samples. Results are discussed in terms of effects for improved oxide scale adherence. Author (GRA)

N84-23723# SRI International Corp., Menlo Park, Calif.
THE CHEMISTRY OF NITROGEN COMPOUNDS IN COMBUSTION PROCESSES Final Report, 1 Nov. 1980 - 31 Oct. 1983
T. G. Slanger 2 Mar. 1984 86 p
(Contract DAAG29-81-K-0001)
(AD-A139539; ARO-17561.3-CH) Avail: NTIS HC A05/MF A01 CSCL 07/2

The major tasks under the current contract have in general involved the photochemistry and kinetics of nitrogenous molecules, using F2 and KrF excimer lasers as initiating sources. The results of this three-year program are summarized below. NO2 has been dissociated at 2485, revealing in its nascent NO vibrational distribution a very strong inversion, in which vibrational levels near the thermodynamic limit of v = 8 are strongly populated. Resonance excitation of NO by the 1576 F2 laser line has been observed and the spectroscopy clarified. The O2(A superscript 3 sigma u(+)) state by laser-induced fluorescence (LIF) has been studied. Radiative lifetimes of the CN(A superscript 2 pi) state have been measured for v = 0-5. Quenching rate coefficients of CN(A superscript 2 pi) by C2N2 have been determined for v = 0-5. An evaluation of the heat of formation of NCO indicates that the most recent determination is inconsistent with kinetic requirements and must be re-interpreted. Photodissociation of C2N2 at 1576 populates CN(A superscript 2 pi) up to the one-photon limit of v = 5, with a strong maximum occuring at v = 2. Simultaneous photodissociation of C2N2 and O2 at 1576 results in greatly enhanced CN(A) and CN(B) emission intensities over those obtained in the absence of O2, due to slow secondary processes. GRA

N84-23724# Cornell Univ., Ithaca, N.Y.
MONTE CARLO CALCULATIONS OF TWO-DIMENSIONAL COMBUSTOR FLOWS Final Report, 13 Jan. 1982 - 12 Jan. 1984
S. B. Pope 5 Mar. 1984 6 p
(Contract DAAG29-82-K-0017)
(AD-A139569; ARO-18863.6-EG) Avail: NTIS HC A02/MF A01 CSCL 21/2

One-dimensional premixed turbulent flames have been studied using the PDF method. These flames are directly relevant to the combustion in spark ignition engines, and are basic to our understanding of yet more complicated combustion phenomena. The objective of the work was to develop a theory to calculate the flame properties as functions of the governing parameters. Author (GRA)

N84-23725# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
ADSORPTION AND CATALYZED REACTIONS OF CO AND CO2 ON GRAPHITE SURFACES
W. T. Tysoe, J. Carrazza, and G. A. Somorjai Dec. 1983 14 p refs Presented at Am. Chem. Soc. Div. of Fuel Chem. Symp. on the Gasification of Chars and Carbonaceous Mater., St. Louis, 8 - 13 Apr. 1984
(Contract DE-AC03-76SF-00098)
(DE84-006625; LBL-17004; CONF-840415-15) Avail: NTIS HC A02/MF A01

The interaction of clean graphite surfaces with CO and CO2 is amenable to investigation using conventional surface science techniques such as AES, TPD, and XPS. Preliminary studies indicate that carboxyl and carbonyl species may be identified and appear to arise from exposure to either CO or CO2. CO2 production at similar temperature in both high pressure reactions and in TPD suggests that carboxyl decomposition may be the rate limiting step to CO2 formation. Anaogously, carbonyl decomposition appears to be rate limiting for the formation of CO. DOE

N84-23726# Hanford Engineering Development Lab., Richland, Wash.
CONTINUOUS ENERGY GAMMA-RAY SPECTROMETRY
Raymond Gold, Bruce J. Kaiser, and James P. McNeece May 1983 7 p refs Presented at the Am. Nucl. Soc. Winter Meeting, San Francisco, 30 Oct. - 4 Nov. 1983
(Contract DE-AC06-76FF-02170)
(DE84-006349; HEDL-SA-2926; CONF-831047-133) Avail: NTIS HC A02/MF A01

Compton recoil gamma-ray spectroscopy provides absolute measurements of continuous gamma-ray spectra. Peaks which possess sufficient intensity above the continuum level can be observed. Since the inception of this spectrometric method, this method has evolved and improved. This paper briefly reviews applications of this method in reactor environments. DOE

N84-23727# California Univ., Berkeley. Lawrence Berkeley Lab.
ELECTROCHEMICAL AND SPECTROELECTROCHEMICAL STUDIES OF SOME COORDINATION COMPOUNDS IN HIGH OXIDATION STATES Ph.D. Thesis
Carol Ann Balfe Jan. 1984 271 p refs
(Contract DE-AC03-76SF-00098)

(DE84-006637; LBL-17269) Copyright. Avail: NTIS HC A12/MF A01

The effect of various axial anions on the reactivity and solution structure of manganese (III) tetraphenylporphyrins was studied with voltmeters and spectroelectrochemistry. Several rhodotorulic acid complexes of vanadium in the +4 and +5 oxidation state were identified and their solution chemistry explored using these methods. The ligand, N,N'-di(2-aminomethylpyridyl)malondiamide and its Ni(II), Cu(II), and Co(III) complexes were prepared and characterized, and preliminary electrochemical studies are conducted. DOE

N84-23728# Brookhaven National Lab., Upton, N. Y.
ZINC ELECTRODE MORPHOLOGY IN ACID ELECTROLYTES Annual Report, 15 Mar. 1982 - 15 Mar. 1983
J. McBreen and E. Gannon Jul. 1983 39 p refs
(Contract DE-AC02-76CH-00016)
(DE84-007184; BNL-51705) Avail: NTIS HC A03/MF A01

The zinc electrode is common to both zinc/chlorine and zinc/bromine flow batteries. Although considerable progress has been made in engineering these batteries, there are still problems with the zinc electrode. The objective of this work is to elucidate the mechanism of zinc deposition in acid electrolytes and to devise methods to control zinc electrode morphology. In this subcontract, work focused on obtaining baseline data in ultra pure zinc chloride and zinc bromide electrolytes. Emphasis was on the initial stages of electrocrystallization. In addition, the effect of modified charging methods, organic surfactants, inorganic additives and substrates was investigated. DOE

N84-23729# Oak Ridge National Lab., Tenn. Chemical Technology Div.
PHOTOSYNTHETIC WATER SPLITTING, PHASE 1 Final Report, 1 Nov. 1980 - 31 Oct. 1983
Elias Greenbaum Dec. 1983 21 p refs Sponsored in part by Gas Research Inst.
(Contract W-7405-eng-26)
(DE84-006847; PB84-171529; ORNL/TM-9009; GRI-84/0018) Avail: NTIS HC A02/MF A01

Original measurements on the kinetics and mechanism of the simultaneous photoproduction of molecular hydrogen and oxygen by intact green algae were performed. It is believed that this concept of renewable energy production is technically sound and that it works with both freshwater algae and marine algae (in which seawater serves as the primary substrate). It was also demonstrated that microalgae are inherently rugged organisms and can be expected to survive for prolonged periods of time in a practical process. DOE

N84-23730# Environmental Protection Agency, Athens, Ga. Environmental Research Lab.
APPLICATION OF A SPRAY DEPOSITION METHOD FOR REVERSED PHASE LIQUID CHROMATOGRAPHY-MASS SPECTROMETRY Final Report
Alfred D. Thurston, Jr. Feb. 1984 18 p refs
(PB84-159029; EPA-600/4-84-011) Avail: NTIS HC A02/MF A01 CSCL 07D

Four coal gasification wastewater samples were analyzed for nonvolatile and polar organics by liquid chromatography-mass spectrometry (LC/MS). Samples were separated on a reverse phase liquid chromatographic column using an aqueous solvent as the eluant. A special spray deposition device was constructed to spray the LC effluent as an aerosol on a Finnigan moving belt LC/MS interface. The evaporated solute on the belt was fed directly to an MS for spectral analysis. In addition to several common organics such as phenol, guaiacol, methyl and dimethylphenols, seven polar compounds were found, and the mass spectrum of each of these was obtained. They could not be identified, however, using available literature or data bases. GRA

N84-23731# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Chemical and Environmental Engineering.
RESEARCH AND RESEARCH NEEDS IN COLLOIDAL INTERACTIONS
C. S. Hirtzel and Raj Rajagopalan Oct. 1983 313 p refs
(PB84-161231; NSF/OIR-83005) Avail: NTIS HC A14/MF A01 CSCL 07D

Research activities in a few areas of colloidal interactions and phenomena are reviewed. The following technical aspects are considered: (1) colloidal phenomena relevant in adsorption, deposition, and reentrainment of species of colloidal dimensions; (2) properties of dispersions at finite concentrations; and (3) experimental and theoretical tools that are of relevance. The current status of research is presented on the following subjects: (1) intermolecular and electrokinetic forces, (2) dilute and concentrated dispersions, and (3) colloidal stability and the related problem of deposition and resuspension of colloidal species on substrates. GRA

N84-23732# National Academy of Sciences - National Research Council, Washington, D. C.
RESEARCH BRIEFINGS FOR THE OFFICE OF SCIENCE AND TECHNOLOGY POLICY, THE NATIONAL SCIENCE FOUNDATION AND SELECTED FEDERAL DEPARTMENTS AND AGENCIES, 1983
1983 97 p
(Grant NSF PLN-82-18330)
(PB84-161322; ISBN-0-309-03437-X) Avail: NTIS HC A05/MF A01 CSCL 07D

Briefings developed by separate panels of experts, charged with identifying major research opportunities in five rapidly advancing fields are examined. The five research briefing topics were: (1) Selected opportunities in chemistry; (2) Cognitive science and artificial intelligence; (3) Immunology; (4) Solid earth sciences; and (5) Computers in design and manufacturing. GRA

N84-23733# Environmental Monitoring and Support Lab., Cincinnati, Ohio.
COMPLIANCE MONITORING OF PURGEABLE ORGANICS WITH MASS SPECTROMETRY
Ann Alford-Stevens 1984 27 p refs
(PB84-157916; EPA-600/D-84-055) Avail: NTIS HC A03/MF A01 CSCL 14B

During the past two years two new methods have been approved for nationwide use for detection and measurement of the four regulated trihalomethanes (THMs) in drinking water. This increases to four the number of available methods for compliance monitoring of THMs. Two of those methods (numbers 501.1 and 501.2) were published in the Federal Register in 1979 and are, therefore, well known to drinking water analysts. The purpose of this paper is to discuss monitoring with the two new methods (numbers 501.3 and 524) and the advantages and disadvantages of each. GRA

N84-23637*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NASA BROAD-SPECIFICATION FUELS COMBUSTION TECHNOLOGY PROGRAM
James S. Fear *In its* Assessment of Alternative Aircraft Fuels Apr. 1984 p 75-78 (For primary document see N84-23630 14-07)
Avail: NTIS HC A09/MF A01 CSCL 21B

N84-23638*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
NASA/GENERAL ELECTRIC BROAD-SPECIFICATION FUELS COMBUSTION TECHNOLOGY PROGRAM
Willard J. Dodds *In* NASA. Lewis Research Center Assessment of Alternative Aircraft Fuels Apr. 1984 p 79-88 refs (For primary document see N84-23630 14-07)
Avail: NTIS HC A09/MF A01 CSCL 21B

N84-23640*# Pratt and Whitney Aircraft Group, West Palm Beach, Fla.
THE NASA BROAD SPECIFICATION FUELS COMBUSTION TECHNOLOGY PROGRAM AT PRATT AND WHITNEY

Robert P. Lohmann *In* NASA. Lewis Research Center Assessment of Alternative Aircraft Fuels Apr. 1984 p 99-110 refs (For primary document see N84-23630 14-07)
Avail: NTIS HC A09/MF A01 CSCL 21B

N84-23688# Florida Univ., Gainesville. Dept. of Mechanical Engineering.
ULTRAVIOLET OH MISSIONS IN H/SUB 2-AIR DIFFUSION FLAMES
K. M. Pamidimukkala, P. F. Schippnick, D. B. Vaidya, and A. E. S. Green *In* APL The 14th JANNAF Plume Technol. Meeting, Vol. 1 1983 p 117-122 refs (For primary document see N84-23678 14-20)
Avail: NTIS HC A07/MF A01 CSCL 21/2

N84-24208# Rensselaer Polytechnic Inst., Troy, N. Y.
STABILITY OF PLANE NEAR-EQUIDIFFUSIONAL FLAMES WITHOUT INVOKING THE CONSTANT-DENSITY APPROXIMATION
T. Jackson and A. Kapila *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 785-789 (For primary document see N84-24173 14-59)
(AD-P002972) Avail: NTIS HC A99/MF A01 CSCL 21/2

N84-24209# Cornell Univ., Ithaca, N.Y.
WRINKLED-FLAME CALCULATIONS REVISITED
H. V. McConnaughey and G. S. S. Ludford *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 791-800 (For primary document see N84-24173 14-59)
(Contracts DAAG29-80-C-0041; DAAG29-81-K-0127; Grant NSF MCS-79-27062)
(AD-P002973) Avail: NTIS HC A99/MF A01 CSCL 21/2

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N84-23734 Deutsche Gesellschaft fuer Metallkunde, Stuttgart (West Germany).
SYSTEMATIC EVALUATION OF TECHNICAL CAUSES OF DAMAGE [SYSTEMATISCHE BEURTEILUNG TECHNISCHER SCHADENSFAELLE]
1983 403 p refs In GERMAN Original language document announced as A84-24426
(ISBN-3-88355-070-1) Copyright. Avail: Issuing Activity

Fundamental guidelines and criteria for the analysis of fracture damage; classification, causes and characteristics of fractures; methods for the analysis of fracture damage; and electron microscopy for damage analysis are discussed. Microscopic and macroscopic forms of slide and separation fractures and vibratory fracture are described. Thermally induced fractures; corrosion damage in metallic materials with and without additional mechanical loading; damage due to high temperature corrosion; wear damage to materials; and damage to welding seams are treated. The use of fracture mechanics in the analysis of damage is discussed. For individual titles, see N84-23735 through N84-23749.

N84-23735 Technische Univ., Brunswick (West Germany). Inst. fuer Werkstoffe.
PROCEDURE OF TREATING A CASE OF DAMAGE [VORGEHENSWEISE BEI DER BEARBEITUNG EINES SCHADENSFALLES]
Guenter Lange *In* Deut. Ges. fuer Metallkunde e.V. Systematic Evaluation of Tech. Causes of Damage 1983 p 7-14 refs In GERMAN Original language document announced as A84-24427 (For primary document see N84-23734 14-39)
Avail: Issuing Activity

Guidelines and criteria for the analysis of fracture damage are presented. If macroscopic fracture assessment is not conclusive, a microscopic assessment using a raster microscope is required. If the microscopic investigation does not confirm the macroscopic results, simulation tests are performed. Depending on the type of damage, materials investigations (metallography, mechanical tests, chemical or nondestructive tests) are necessary. Author (ESA)

N84-23736 Technische Univ., Brunswick (West Germany). Inst. fuer Werkstoffe.
CLASSIFICATION, CAUSES, AND CHARACTERISTICS OF FRACTURES [EINTEILUNG, URASCHEN UND KENNZEICHEN DER BRUECHE] c39
Guenter Lange *In* Deut. Ges. fuer Metallkunde e.V. Systematic Evaluation of Tech. Causes of Damage 1983 p 15-23 ref In GERMAN Original language document announced as A84-24428 (For primary document see N84-23734 14-26)
Avail: Issuing Activity

Three classes of fractures are classified and their characteristics and causes are reviewed. Fractures due to mechanical stress, corrosion determined cracks and fractures, and temperature determined cracks and fractures are covered. For each of the classes a subclassification is given, and the causes and characteristics of each damage case are described. Author (ESA)

N84-23737 Karlsruhe Univ. (West Germany). Inst. fuer Werkstoffunde 1.
MATERIALS INVESTIGATIONS [WERKSTOFFUNTERSUCHUNGEN] c38
Hermann Mueller *In* Deut. Ges. fuer Metallkunde e.V. Systematic Evaluation of Tech. Causes of Damage 1983 p 25-47 refs In GERMAN Original language document announced as A84-24429 (For primary document see N84-23734 14-26)
Avail: Issuing Activity

Methods for the analysis of a case of fracture damage are presented. Four classes of materials investigation are considered: metallographic, mechanical, nondestructive, and chemical investigation. Each of these methods is explained, and the possibilities of evaluating a case of fracture damage are presented. Author (ESA)

N84-23738 Technische Hochschule, Aachen (West Germany). Gemeinschaftslab. fuer Elektronenmikroskopie.
ELECTRON MICROSCOPY FOR DAMAGE ANALYSIS [ELEKTRONENMIKROSKOPIE BEI DER SCHADENSANALYSE] c35
Michael Pohl *In* Deut. Ges. fuer Metallkunde e.V. Systematic Evaluation of Tech. Causes of Damage 1983 p 49-77 refs In GERMAN Original language document announced as A84-24430 (For primary document see N84-23734 14-26)
Avail: Issuing Activity

The principles of transmission electron microscopes, raster electron microscopes and microprobes, and electron beam microanalysis (wavelength dispersive and energy dispersive spectrometers) are explained. Slide preparation for fracture investigations with electron microscopes is treated. The possibilities of electron beam metallography are presented. Examples of investigations of materials defects and materials damage using electron microscopes are given. Author (ESA)

N84-23739 Technische Univ., Brunswick (West Germany). Inst. fuer Werkstoffe.
MICROSCOPIC AND MACROSCOPIC APPEARANCE OF DUCTILE VIOLENT FRACTURES (SLIDE FRACTURES) [MIKROSKOPISCHE UND MAKROSKOPISCHE ERSCHEINUNGSFORMEN DES DUKTILEN GEWALTBRUCHES (GLEITBRUCH)]
Guenter Lange *In* Deut. Ges. fuer Metallkunde e.V. Systematic Evaluation of Tech. Causes of Damage 1983 p 79-97 refs In GERMAN Original language document announced as A84-24431 (For primary document see N84-23734 14-26)
Avail: Issuing Activity

The conical-cup fracture, milling-cutter like fracture, shear stress fracture, and drawing to a point are treated. The mechanisms of each of these fracture forms are explained. The influence of material and loading on the honeycomb fracture structure is discussed. Author (ESA)

N84-23740 Karlsruhe Univ. (West Germany). Inst. fuer Werkstoffkunde 1.
MACROSCOPIC AND MICROSCOPIC APPEARANCE OF SEPA-

RATION FRACTURES [MAKROSKOPISCHE UND MIKROSKOPISCHE ERSCHEINUNGSFORMEN DES TRENNBRUCHES]
Hermann Mueller *In* Deut. Ges. fuer Metallkunde e.V. Systematic Evaluation of Tech. Causes of Damage 1983 p 99-124 refs In GERMAN Original language document announced as A84-24432 (For primary document see N84-23734 14-26)
Avail: Issuing Activity

The separation fracture, quasi-separation fracture, grain-boundary fracture and mixed fractures are treated. The mechanisms of crack formation, crack propagation, and fracturing are explained for each of the forms of separation fracture. Parameters which contribute to separation fracture are discussed. Author (ESA)

N84-23741 Technische Univ., Brunswick (West Germany). Inst. fuer Werkstoffe.
MACROSCOPIC APPEARANCE OF VIBRATORY FRACTURES [MAKROSKOPISCHE ERSCHEINUNGSFORMEN DES SCHWINGBRUCHES] **c39**
Guenter Lange *In* Deut. Ges. fuer Metallkunde e.V. Systematic Evaluation of Tech. Causes of Damage 1983 p 125-154 refs In GERMAN (For primary document see N84-23734 14-26)
Avail: Issuing Activity

Macroscopic forms of vibratory (fatigue) fracture of metals are described. Crack initiation, and vibratory crack formation are depicted. Remedial measures against vibratory fractures are explained. Examples of the initiation of fractures (stiffness jump, surface defects) are given. Author (ESA)

N84-23742 Karlsruhe Univ. (West Germany). Inst. fuer Zuverlaessigkeit und Schadenskunde im Maschinenbau.
MICROSCOPIC APPEARANCE OF VIBRATORY FRACTURES [MIKROSKOPISCHE ERSCHEINUNGSFORMEN DES SCHWINGBRUCHES] **c39**
Dietrich Munz *In* Deut. Ges. fuer Metallkunde e.V. Systematic Evaluation of Tech. Causes of Damage 1983 155-183 refs In GERMAN (For primary document see N84-23734 14-26)
Avail: Issuing Activity

Fracture damage evaluations of different phases in the evolution of a vibratory fracture are described (crack initiation, microcrack propagation, macrocrack propagation, and test fracture). Microscopic pictures are shown for each of the phases and their characteristic fracture plane appearances. The influence of a corrosive medium is discussed. Author (ESA)

N84-23743 Technische Hochschule, Aachen (West Germany). Gemeinschaftslab. fuer Elektronenmikroskopie.
THERMALLY INDUCED FRACTURES [THERMISCH INDUZIERTE BRUECHE]
Michael Pohl *In* Deut. Ges. fuer Metallkunde e.V. Systematic Evaluation of Tech. Causes of Damage 1983 p 185-206 refs In GERMAN (For primary document see N84-23734 14-26)
Avail: Issuing Activity

Cracks and fractures induced by high temperatures are described. The heat resistance of materials and the requirements for their use at high temperatures are discussed. Cold cracks (hardening and plating cracks), hot cracks (solidification and melting cracks), and heat treatment cracks are treated. The resistance in time of materials in high temperature environments is discussed. Author (ESA)

N84-23744 Allianz-Zentrum fuer Technik G.m.b.H., Ismaning (West Germany).
CORROSION DAMAGE IN METALLIC MATERIALS WITHOUT MECHANICAL LOADING [KORROSIONSSCHAEDEN AN METALLISCHEN WERKSTOFFEN OHNE/MECHANISCHE BEANSPRUCHUNG]
P. Forchhammer *In* Deut. Ges. fuer Metallkunde e.V. Systematic Evaluation of Tech. Causes of Damage 1983 p 207-230 refs In GERMAN Original language document announced as A84-24436 (For primary document see N84-23734 14-26)
Avail: Issuing Activity

The different forms of corrosion without loading are described: uniform surface corrosion, trough corrosion, hole corrosion, crack corrosion, contact corrosion, dew-point corrosion, standstill corrosion, oxygen corrosion, and selective corrosion. Standard corrosion tests are described. Author (ESA)

N84-23745 Allianz-Zentrum fuer Technik G.m.b.H., Ismaning (West Germany).
CORROSION DAMAGE WITH ADDITIONAL MECHANICAL LOADING [KORROSIONSSCHAEDEN BEI ZUSAETZLICHER MECHANISCHER BEANSPRUCHUNG]
John Hickling *In* Deut. Ges. fuer Metallkunde e.V. Systematic Evaluation of Tech. Causes of Damage 1983 p 231-267 refs In GERMAN Original language document announced as A84-24437 (For primary document see N84-23734 14-26)
Avail: Issuing Activity

The definition, mechanisms of crack formation, characteristics for damage analysis, and measures to prevent damage are described for stress crack corrosion (conventional, hydrogen-induced, and expansion-induced form), vibratory (fatigue) crack corrosion (high cyclic and how cyclic), erosion corrosion (flow-induced, fluid-impact, solid-impact forms), cavitation corrosion, and friction corrosion. Macroscopic and microscopic pictures are shown. Author (ESA)

N84-23746 Allianz-Zentrum fuer Technik G.m.b.H., Ismaning (West Germany).
DAMAGE DUE TO HIGH TEMPERATURE CORROSION [SCHAEDEN DURCH HOCHTEMPERATURKORROSION]
P. H. Effertz *In* Deut. Ges. fuer Metallkunde e.V. Systematic Evaluation of Tech. Causes of Damage 1983 p 269-298 refs In GERMAN Original language document announced as A84-24438 (For primary document see N84-23734 14-26)
Avail: Issuing Activity

Different types of high temperature corrosion (HTC) are described. Reaction thermodynamics, reaction kinetics, and characteristics are presented for HTC in hot gases (oxidation, carbonization, attack by hydrogen), HTC under deposits (HTC on overheating pipes of coal fired boilers, HTC on gas turbine blades), and HTC in metal melting. Author (ESA)

N84-23747 Technische Hochschule, Aachen (West Germany). Gemeinschaftslab. fuer Elektronenmikroskopie.
WEAR DAMAGE TO MATERIALS [WERKSTOFFSCHAEDEN DURCH VERSCHLEISS] **c37**
Michael Pohl *In* Deut. Ges. fuer Metallkunde e.V. Systematic Evaluation of Tech. Causes of Damage 1983 p 299-328 refs In GERMAN (For primary document see N84-23734 14-26)
Avail: Issuing Activity

The fundamental mechanisms of adhesion wear, abrasion wear, fatigue wear, and wear in the boundary sheet by tribochemical reactions are presented. Wear due to dry friction in iron alloys, chromium-nickel steels, high strength steels, and high temperature environments; wear in bearing materials; and wear in antifriction bearings are treated. The use of protective coatings is discussed. Author (ESA)

N84-23748 Allianz-Zentrum fuer Technik G.m.b.H., Ismaning (West Germany).
DAMAGE TO WELDING SEAMS [SCHAEDEN AN SCHWEISSNAEHTEN] **c37**
H.-J. Schueller *In* Deut. Ges. fuer Metallkunde e.V. Systematic Evaluation of Tech. Causes of Damage 1983 p 329-379 refs In GERMAN (For primary document see N84-23734 14-26)
Avail: Issuing Activity

Cracks occurring in fusion welding seams are reviewed. The positions of cracks in welding junctions are discussed. The mechanism of crack formation is described for construction cracks (hot cracks, cold cracks, blade cracks, relaxation cracks), and operation cracks (cracks due to overloading, cracks due to welding defects). Crack prevention measures are discussed. Author (ESA)

N84-23749 Karlsruhe Univ. (West Germany). Inst. fuer Zuverlaessigkeit und Schadenskunde im Maschinenbau.
FRACTURE MECHANICS IN THE ANALYSIS OF DAMAGE

[BRUCHMECHANIK IN DER SCHADENSANALYSE] c39
Dietrich Munz *In* Deut. Ges. fuer Metallkunde e.V. Systematic Evaluation of Tech. Causes of Damage 1983 p 377-401 refs In GERMAN Original language document announced as A84-24439 (For primary document see N84-23734 14-26)
Avail: Issuing Activity

The application domain of linear-elastic fracture mechanics is outlined. Stable and unstable crack propagation for an unidirectional load; undercritical crack growth for an alternating load; and undercritical crack growth for a constant load in an aggressive medium are discussed. Lifetime calculations, breakdown by plastic instability, and the two-criteria method are presented. The case of a vessel under inner pressure is treated. The fracture mechanical evaluation of damage is explained. Author (ESA)

N84-23750*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FRACTURE TEMPERATURE AND FLAW GROWTH IN NITRONIC 40 AT CRYOGENIC TEMPERATURES
Marcia S. Domack May 1984 46 p refs
(NASA-TP-2312; L-15722; NAS 1.60:2312) Avail: NTIS HC A03/MF A01 CSCL 11F

The fracture resistance and fatigue response of Armco Nitronic 40 austenitic stainless steel were evaluated under cryogenic conditions. Tensile, fracture toughness and fatigue crack growth properties were measured at -275 F. The tensile yield strength was approximately 120 ksi and the fracture toughness was estimated to be 350 ksi-in /2 on the basis of fracture toughness measurements. Testing was conducted to evaluate the behavior of a simulated section of the wing of the Pathfinder 1 model subject to a load and temperature history typical of that for testing in the National Transonic Facility. The wing section model incorporated a proposed brazing technique for pressure-transducer attachment. The simulated wing section performed satisfactorily at stress levels of nearly 60 percent of the material yield strength. The brazing technique proved to be an effective method of transducer attachment under conditions of high stress levels and large temperature excursions. Author

N84-23751*# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Casting of Metals.
SOLUBILITY OF HYDROGEN IN METALS AND ITS EFFECT OF PORE-FORMATION AND EMBRITTLEMENT Ph.D. Thesis
Hamid R. Shahani 1984 122 p refs
(NASA-CR-173399; NAS 1.26:173399) Avail: NTIS HC A06/MF A01 CSCL 11F

The effect of alloying elements on hydrogen solubility were determined by evaluating solubility equations and interaction coefficients. The solubility of dry hydrogen at one atmosphere was investigated in liquid aluminum, Al-Ti, Al-Si, Al-Fe, liquid gold, Au-Cu, and Au-Pd. The design of rapid heating and high pressure casting furnaces used in meta foam experiments is discussed as well as the mechanism of precipitation of pores in melts, and the effect of hydrogen on the shrinkage porosity of Al-Cu and Al-Si alloys. Hydrogen embrittlement in iron base alloys is also examined. A.R.H.

N84-23752*# General Electric Co., Huntsville, Ala.
ANALYSIS AND CALCULATION OF MACROSEGREGATION IN A CASTING INGOT, EXHIBITS C AND E Final Report
David R. Poirier (Arizona Univ.) and Anna L. Maples Jan. 1984 86 p refs
(Contract NAS8-33573)
(NASA-CR-171030; NAS 1.26:171030; Rept-84HV001) Avail: NTIS HC A05/MF A01 CSCL 11F

A computer model which describes the solidification of a binary metal alloy in an insulated rectangular mold with a temperature gradient is presented. A numerical technique, applicable to a broad class of moving boundary problems, was implemented therein. The solidification model described is used to calculate the macrosegregation within the solidified casting by coupling the equations for liquid flow in the solid/liquid or mushy zone with the energy equation for heat flow throughout the ingot and thermal convection in the bulk liquid portion. The rate of development of the solid can be automatically calculated by the model. Numerical analysis of such solidification parameters as enthalpy and boundary layer flow is displayed. On-line user interface and software documentation are presented. R.S.F.

N84-23753# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A DETAILED COMPARISON OF HYDROGEN AND MERCURY EMBRITTLEMENT IN MONEL 400 M.S. Thesis
R. S. Fredell Dec. 1983 96 p
(AD-A139119; AFIT/CI/NR-83-79T) Avail: NTIS HC A05/MF A01 CSCL 11/6

Slow strain rate tensile tests were performed on annealed Monel 400 specimens, with grain sizes ranging from 35 to 500 micrometers, in air, liquid mercury, and gaseous hydrogen. Annealed 250 micrometer grain size Monel 400 samples were also tested, at strain rates ranging from .016/s to .0000016/s, and in high cycle fatigue, in the three environments. The similarities in mechanical behavior and fractographic appearance between hydrogen and mercury embrittlement were then analyzed. The results were compared with the predictions made by some of the current theories of hydrogen and mercury embrittlement. The tests showed that Monel 400 is embrittled by both gaseous hydrogen and liquid mercury, and that the latter is the more severe environment. A common fracture sequence was identified in both environments, and the alloy became more embrittled with the decreasing strain rate. These results pointed to a thermally activated embrittlement mechanism for hydrogen and mercury. The effect of increasing grain size caused mixed results in the tests in mercury, but caused a steady decrease in hydrogen embrittlement. Two competing processes were tentatively identified as the causes of the grain size effect. GRA

N84-23754# Lehigh Univ., Bethlehem, Pa. Dept. of Metallurgy and Materials Engineering.
A STUDY OF FATIGUE CRACK PROPAGATION IN POWDER METALLURGY HOT ISOTATICALLY PRESSED NICKEL-BASE ALLOY Annual Report, 1 Jan. - 31 Dec. 1983
R. W. Hertzberg 31 Jan. 1984 11 p
(Grant AF-AFOSR-0029-83; AF Proj. 2306)
(AD-A139290; AFOSR-84-0164TR) Avail: NTIS HC A02/MF A01 CSCL 11/6

Initial efforts were addressed at the preparation of powders that would result in the development of HIP'd logs possessing a large range of grain sizes and grain size distributions. After several trials, it was determined that the widest range of alloy grain size could be obtained by using different HIPing temperatures in conjunction with different solution treatments (ST). The following treatments and grain sizes are identified: (1107 C HIP + 1121 C ST (ASTM No. 13)); (1107 C HIP + 1149 C ST (Duplex size ASTM average 8-9); (1107 C HIP + 1177 C ST (ASTM No. 6-6.5)); (1246 C HIP + 1149 C ST (ASTM No. 4)). Further aging treatments are planned at 650 C and 800 C to obtain fine and coarse gamma precipitate sizes, respectively. Initial fatigue crack propagation tests were completed with both material and computer-controlled test system performing in a well behaved manner. Crack closure measurements were obtained which allowed crack growth rate data to be compared with delta K sub eff. Grips and fixtures have been designed and ordered which will permit cyclic strain experiments to be conducted at both room and elevated temperatures. Techniques were developed to prepare thin foils to allow for detailed examination of alloy microstructures and cyclic load-induced dislocation structures. GRA

N84-23755# Pratt and Whitney Aircraft Group, West Palm Beach, Fla.
APPLICATION OF RAPIDLY SOLIDIFIED SUPERALLOYS Quarterly Report, 1 Aug. - 31 Oct. 1976
A. R. Cox and R. J. Patterson Nov. 1976 23 p
(Contract F33615-76-C-5136)
(AD-A139350; PWA-FR-8062) Avail: NTIS HC A02/MF A01 CSCL 11/6

This program is being conducted for the purpose of applying

the principle of rapid solidification to superalloy powders and subsequent development of stronger compositions for jet engine turbine airfoils. Centrifugal atomization and forced convective cooling of the material are being used for producing the fast cooled material. During this period, characteristics of powder yield resulting from high speed atomization were determined as was actual quench gas requirements on the basis of observed particle size distribution. The yield can be described as a statistically normal distribution. The heat release profiles generated by this distribution result in an allowable reduction of about 50% in He gas requirement from original rig design criteria. Eighteen alloy lots were compacted for material equations, 14 of which were subsequently extruded. The compaction and extrusion parameters were typical of those used for conventionally processed superalloy powders. Although the results were good visually, recrystallization was not achieved in the manner expected, and it will be necessary to determine effective working procedures specifically for this material. Author (GRA)

N84-23756# Stanford Univ., Calif. Dept. of Materials Science and Engineering.

AN INVESTIGATION OF THE STRUCTURE AND HIGH TEMPERATURE MECHANICAL PROPERTIES OF OXIDE DISPERSION STRENGTHENED ALLOYS Interim Scientific Report, 1 Oct. 1982 - 30 Sep. 1983

W. D. Nix Feb. 1984 47 p

(Grant AF-AFOSR-0022-81; AF Proj. 2306)

(AD-A139359; AFOSR-84-0163TR) Avail: NTIS HC A03/MF A01 CSCL 11/6

The structure and high temperature mechanical properties of oxide dispersion strengthened alloys are being studied. We have observed and studied superplastic properties in fine grained MA 6000 and MA 754. These properties have been described by a model which couples dislocation and diffusional creep. The creep properties of coarse grained MA 754 are also being studied. We have observed that cavitation contributes to the creep rate at low stresses and high temperatures and that grain boundary degradation occurs by diffusional processes. Work on the structure and properties of Al-Fe-Ce alloys is just starting. Author (GRA)

N84-23757# Johns Hopkins Univ., Baltimore, Md. Center for Materials Research.

METASTABLE PHASES OF RAPIDLY SOLIDIFIED Al-RICH, Al-Fe ALLOYS Progress Report, 1 Sep. 1983 - 1 Jan. 1984

D. Schechtman and E. Horowitz Jan. 1984 43 p

(Contract MDA903-83-K-0400)

(AD-A139598; CMR-DARPA-8) Avail: NTIS HC A03/MF A01 CSCL 11/6

As part of a continuing investigation on the characterization of rapidly solidified alloys, the present report describes the results of the study of the various phases observed in rapidly solidified aluminum rich, aluminum-iron alloys. Two experimental techniques, transmission electron microscopy (TEM) and nuclear gamma-ray resonance (NGR) were used to obtain valuable data and information on the microstructure and composition of selected alloys. The aluminum alloys described in this report cover a broad range of iron concentrations and consist of samples in the Fe 1 weight percent to 34 weight percent range. The interesting features of the microstructure are discussed also in these terms. Aluminum-iron alloys with 18 weight precent Fe were subjected to a series of heat treatments in order to evaluate the thermal stability of the phases. Special care has been exercised in reproducing the microphotographs in order to preserve for the reader the unique microstructural details captured in the original observations. GRA

N84-23758# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.

PREVENTION OF STRESS-CORROSION CRACKING IN NUCLEAR WASTE STORAGE TANKS

Robert S. Ondrejcin 1984 37 p refs Presented at the NACE Corrosion Intern. Forum and Exhibition, New Orleans, 2-6 Apr. 1984

(Contract DE-AC09-76SR-00001)

(DE84-001410; DP-MS-83-79; CONF-840405-3) Avail: NTIS HC A03/MF A01

Stress corrosion cracking (SCC) occurred in the early versions of carbon steel primaries of nuclear waste tanks at the Savannah River Plant. Evaporated alkaline nitrate wastes in the form of crystallized salts are dissolved from some of these tanks for transfer to new tanks of a different design. The levels of inhibitors required to prevent cracking at yield stresses were determined to prevent the SCC sequence from occurring during salt dissolution. Statistically designed experiments were performed to evaluate the probability of cracking under the combined influences of nitrate, nitrite, hydroxide, and temperature. Samples were tested by a potentially controlled constant extension rate test and by wedge opening loaded samples. Two equations were derived by multivariate regression analyses that correlated probability of cracking as the dependent variable to nitrate, nitrite, and hydroxide concentrations and temperature as the independent variables. Simple operating standards were developed by setting the probability of cracking equal to zero and solving for the four independent variables. DOE

N84-23759# Brookhaven National Lab., Upton, N. Y.

PREDICTION OF LONG TERM CREVICE CORROSION AND HYDROGEN EMBRITTLEMENT BEHAVIOR OF ASTM GRADE-12 TITANIUM

T. M. Ahn and H. Jain 1984 20 p refs Presented at the NACE Corrosion Intern. Forum and Exhibition, New Orleans, 2-4 Apr. 1984

(Contract DE-AC02-76CH-00016)

(DE84-002575; BNL-NUREG-33731; CONF-840405-4) Avail: NTIS HC A02/MF A01

Crevice corrosion and hydrogen embrittlement are potential failure modes of Grade-12 titanium high-level nuclear waste containers emplaced in rock salt repositories. The macroscopic concentration cell formation responsible for crevice corrosion is accompanied by oxygen depletion, potential drop, anion accumulation and acidification inside the crevice. This process is quantified by simple mass balance equations which show that the immunity domain is a function of the time the container is exposed to the corrosion environment. Strain induced hydride formation is responsible for hydrogen assisted crack initiation. A model for slow crack growth is developed using data on growth rates measured at various temperatures. The parameters obtained in the model are used to estimate the threshold stress intensity and hydrogen solubility limit in the alloy at infinite container service time. This value gives a crack size below which container failure will not occur for a given applied stress and hydrogen concentration, and a hydrogen concentration limit at a given stress intensity. DOE

N84-23760# Sandia Labs., Albuquerque, N. Mex.

ENERGY AND STATISTICAL EFFECTS IN THE DYNAMIC FRAGMENTATION OF METAL RINGS

D. E. Grady, M. E. Kipp, and D. A. Benson 1984 7 p refs Presented at 3rd Meeting on Liquid Metal in Energy Appl., Oxford, 9 Apr. 1984

(Contract DE-AC04-76DP-00789)

(DE84-005458; SAND-83-0859C; CONF-840411-7) Avail: NTIS HC A02/MF A01

The ductile failure of rapidly expanding metal rings is considered with emphasis on the role of inertial forces in the dynamic fragmentation process. Expressions for the fragment size and fracture strain dependence on strain rate are obtained and compared with experiments on aluminum and copper rings. The experimental fragment size distribution is examined in light of theories based on a random fracture process. DOE

N84-23761# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.

INFLUENCE OF THE VISCOUS ENVIRONMENTS ON FATIGUE CRACK PROPAGATION IN A LOWER STRENGTH STEEL M.S. Thesis

Jye-Len Tzou Jun. 1983 81 p refs

(Contract DE-AC03-76SF-00098)

(DE84-008247; LBL-16262) Avail: NTIS HC A05/MF A01

The effect of dehumidified silicone and paraffin oils with

viscosities from 5 to 60,000 centistokes (cS) on fatigue crack propagation in a lower strength 2 1/4Cr-1Mo pressure vessel steel (ASTM A542 Class 3) was studied at both near-threshold (less than or equal to 10 to the minus 6 power mm/cycle) and higher (approx. 10 to the minus 6 power to 10 to the minus 3 power mm/cycle) growth rates. It is found that, at low load ratios, crack growth rates in oils are lower than in moist air and dry hydrogen and increase in increasing oil viscosity in higher growth rate region. However, at near-threshold levels, crack growth rates in oils are considerably higher than in moist air and are not affected by the viscosity of oil. At high load ratios, although crack propagation in oils is lower in higher growth rate region and unchanged at near-threshold levels when compared to that in moist air, no effect of oil viscosity can be observed. Such observations are discussed and quantitatively analyzed in terms of three mutually competitive mechanisms specific to dry viscous environments, namely suppression of moisture-induced hydrogen embrittlement and/or metal dissolution, minimization of oxide-induced crack closure and hydrodynamic wedging effects of the viscous fluid within the crack. DOE

N84-23762# Ames Lab., Iowa.
RESISTIVITY AND STRAIN BEHAVIOR DURING TRANSFORMATION CYCLING IN NICKEL-TITANIUM M.S. Thesis
Kyou Haeng Lee Sep. 1983 73 p refs
(Contract W-7405-eng-82)
(DE84-006640; IS-T-1179) Avail: NTIS HC A04/MF A01

Uncycled NITINOL wires and wires cycled 5.78 million times were studied. Resistivity and strain were as a function of temperature at various applied uniaxial tensile stresses. The resistivity-temperature and strain-temperature behaviors were observed to depend on the temperature or the portion of the transformation cycle at which the stress change is made. The low temperature resistivity and strain increased with increasing stress. The transformation fatigue cycled wires showed a higher and broader resistivity peak with two-stage behavior. The increase in strain with increasing stress is explained in terms of the crystallographic multiplicity of martensite plates and the alteration of the martensite plate structure in response to the applied stress. Prio transformation fatigue cycling causes a decrease in the applied stress dependence of the total strain changes. DOE

N84-23763# Bureau of Mines, Avondale, Md.
STRUCTURE AND POROSITY OF ELECTRODEPOSITED PLATINUM: EVALUATION OF 4 PLATING METHODS Report of Investigations, 1983
M. L. Lynch, R. P. Walters, and D. R. Flinn Dec. 1983 25 p refs
(PB84-152933; BM-RI-8829; LC-83-600236) Avail: NTIS HC A03/MF A01 CSCL 11C

The Bureau of Mines evaluated the feasibility of substituting platinum-coated metals for bulk platinum shapes as a means for conserving platinum. Platinum coatings were prepared using four different methods of electrodeposition, then tested and evaluated. The Bureau evaluated direct-current, current reversal, cathode shielding, and pulsed-current plating techniques for producing a pore-free platinum electrodeposition from a molten cyanide bath. Aqueous corrosion tests of Fe-10Cr substrates coated with approximately 25 micrometers of platinum showed that pulse plating yielded the most corrosion-resistant and, hence, the most porefree coatings. The morphology of coating cross sections was in all cases columnar. The average grain size of pulsed-plated deposits as independent of thickness, while all other plating techniques produced grains that increased in size as the coatings became thicker. Author (GRA)

N84-23559# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Metallische Werkstoffe.
ADDITIONALLY COMPRESSED TITANIUM FINE CAST COMPONENTS [NACHVERDICHTETE TITAN - FEINGUSSSTELLE]
K. Blomeier *In its* Develop. and Demonstration of Econ. Production Systems in Airframe Construct., Part 2, Part 6 Nov. 1983 p 81-83 In GERMAN (For primary document see N84-23555 14-01)
Avail: NTIS HC A08/MF A01

N84-23897*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
METALLIC ADHESION AND BONDING
John Ferrante, John R. Smith (General Motors Research Labs.), and James H. Rose (Ames Lab.) *In its* Tribology in the 80's. Vol. 1 Apr. 1984 p 143-162 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01 CSCL 11F

N84-23898*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE STRENGTH OF THE METAL. ALUMINUM OXIDE INTERFACE
Stephen V. Pepper *In its* Tribology in the 80's. Vol. 1 Apr. 1984 p 165-175 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01 CSCL 11F

N84-23901*# Battelle Columbus Labs., Ohio.
MICROSTRUCTURES ASSOCIATED WITH WEAR
W. A. Glaeser *In* NASA Lewis Research Center Tribology in the 80's. Vol. 1 Apr. 1984 p 219-235 refs (For primary document see N84-23891 14-37)
(Contract N00014-82-6-0255)
Avail: NTIS HC A22/MF A01 CSCL 11F

N84-24456# Pasteur (Louis) Univ., Strasbourg (West Germany). Lab. de Spectroscopie et D'Optique du Corps Solide.
OPTICAL BISTABILITY IN CuCl Abstract Only
B. Honerlage, J. Y. Bigot, and R. Levy *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N84-23764*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SIMULATION OF LUBRICATING BEHAVIOR OF A THIOETHER LIQUID LUBRICANT BY AN ELECTROCHEMICAL METHOD
Wilfredo Morales May 1984 12 p refs
(NASA-TP-2316; E-1808; NAS 1.60:2316) Avail: NTIS HC A02/MF A01 CSCL 11H

An electrochemical cell was constructed to explore the possible radical anion forming behavior of a thioether liquid lubricant. The electrochemical behavior of the thioether was compared with the electrochemical behavior of biphenyl, which is known to form radical anions. Under controlled conditions biphenyl undergoes a reversible reaction to a radical anion, whereas the thioether undergoes an irreversible reduction yielding several products. These results are discussed in relation to boundary lubrication. Author

N84-23765*# National Aeronautics and Space Administration, Washington, D. C.
GAS PRESSURE SINTERING OF BETA-SIALON WITH Z=3
E. Tani, H. Ichinose, K. Kishi, S. Umebayashi, and K. Kobayashi Apr. 1984 7 p refs Transl. into ENGLISH from Yogyo Kyokai Shi (Tokyo), v. 91, no. 11, 1983 p 522-524 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Government Industrial Research Inst., Kyushu
(Contract NASw-3541)
(NASA-TM-77421; NAS 1.15:77421) Avail: NTIS HC A02/MF A01 CSCL 11G

An experiment conducted on beta-sialon in atmospheric pressure, using a temperature of 2000 C and 4 MPa nitrogen atmosphere, is described. Thermal decomposition was inhibited by the increase of the nitrogen gas pressure. A.R.H.

N84-23766# McGill Univ., Montreal (Quebec). Dept. of Chemistry.
PHYSICAL PROPERTIES AND STRUCTURE OF ION-CONTAINING POLYMERS Final Report, Apr. 1977 - Sep. 1983
A. Eisenberg Jan. 1984 28 p
(Contracts DAAG29-79-C-0159; DAAG29-80-C-0144; Grant DAAG29-77-G-0121)
(AD-A139137; ARO-14613-CH; ARO-17438.13-CH) Avail: NTIS HC A03/MF A01 CSCL 11/9

An extensive study of the properties of ionomers has been performed. One phase involved structure-property relations in styrene ionomers in which the placement of the ions, their type, and their concentration was varied systematically. Other variables involved changes in chain geometry. Also, a method was developed for compatibilizing otherwise immiscible polymers involving ionic interactions and finally, some studies were performed on Nafion membranes. Author (GRA)

N84-23767# Wisconsin Univ., Madison.
A FINITE DIFFERENCE STUDY OF THE STRETCHING AND BREAK-UP OF FILAMENTS OF POLYMER SOLUTIONS Technical Summary Report
P. Markowich and M. Renardy Jan. 1984 16 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-82-10950.)
(AD-A139258; MRC-TSR-2627) Avail: NTIS HC A02/MF A01 CSCL 12/1

The stretching and break-up of a viscoelastic filament pulled by a constant weight is studied numerically by a finite difference method. The results show the following tendencies: (1) Newtonian filaments, even in the absence of surface tension, show a rapid increase in elongation at one particular point (these break there), (2) The addition of a viscoelastic polymer prevents or at least delays the break-up, even if it makes only a small difference to shear viscosity, (3) Surface tension accelerates break-up, but even in the presence of surface tension elasticity has a stabilizing effect. Author (GRA)

N84-23768# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
THERMAL EVALUATION OF SELECTED ABLATIVE MATERIALS IN TRANSIENT LOW HEAT FLUX ENVIRONMENTS M.S. Thesis - Massachusetts Inst. of Tech.
J. P. Marques May 1983 212 p Sponsored by Navy
(AD-A139441; CSDL-T-809) Avail: NTIS HC A10/MF A01 CSCL 11/7

This thesis attempts to evaluate the thermal performance of ablative materials subjected to a common, transient, low-heat flux environment. Experiments were conducted to provide backface, substrate, and surface temperature histories for each of the ten ablators under examination. The tests are useful in determining the relative merit of the materials, and can be used as a screening tool by removing obviously poor performers from further evaluation. Data obtained during testing are correlated with results of a sophisticated computer ablation model. The ultimate objective of these experimental evaluations is the relative ranking of materials studied, and subsequent selection of the ablator which provided the best thermal protection in the environment of concern, based upon applicable thermal insulation performance indices.
Author (GRA)

N84-23769# Argonne National Lab., Ill. Materials Science and Technology Div.
APPLICATION OF NDE METHODS TO GREEN CERAMICS: INITIAL RESULTS
D. S. Kupperman, H. B. Karplus, R. B. Poeppel, W. A. Ellingson, H. Berger (Industrial Quality, Inc.), C. Robbins (NBS), and E. Fuller (NBS) 1983 14 p refs Presented at the TMS-AIME Fall Meeting, Philadelphia, 5 Oct. 1983
(Contract W-31-109-eng-38)
(DE84-006411; CONF-8310205-8) Avail: NTIS HC A02/MF A01

The effectiveness of microradiography, ultrasonic methods, nuclear magnetic resonance, and neutron radiography was assessed for the nondestructive evaluation of green (unfired) ceramics. The application of microradiography to ceramics is reviewed, and preliminary experiments with a commercial microradiography unit are described. Conventional ultrasonic techniques are difficult to apply to flaw detection green ceramics because of the high attenuation, fragility, and couplant-absorbing properties of these materials. However, velocity, attenuation, and spectral data were obtained with pressure-coupled transducers and provided useful information related to density variations and the presence of agglomerates. Nuclear magnetic resonance (NMR) imaging techniques and neutron radiography were considered for detection of anomalies in the distribution of porosity. With NMR, areas of high porosity might be detected after the samples are doped with water. In the case of neutron radiography, although imaging the binder distribution throughout the sample may be feasible because of the low overall concentration of binder, regions of high binder concentration (thus high porosity) should be detectable. DOE

N84-23770# California Inst. of Tech., Pasadena. Lab. of Engineering.
EFFECT OF PRESSURE ON THE MECHANICAL PROPERTIES OF POLYMERS, PART 3 Final Report
N. W. Tschoegl Feb. 1984 106 p refs
(Contract DE-AT03-76ER-75016)
(DE84-006653; DOE/ER-75016/T2-Pt-3) Avail: NTIS HC A06/MF A01

Primary objective was to contribute to our understanding of the effect of pressure on the mechanical properties of polymers. A secondary objective was directed towards the problem of bulk relaxation in polymers via measurements of the time-dependent Poisson's ratio. Finally, work was carried out in order to deepen our understanding of large deformation behavior in elastomers. This study was undertaken in preparation for possible later work on large deformation behavior under superposed hydrostatic pressure. DCE

N84-23771# Dow Corning Corp., Midland, Mich.
INVESTIGATION OF STRUCTURE-PERMEABILITY RELATIONSHIPS OF SILICONE POLYMER MEMBRANES Annual Report, Oct. 1982 - Sept. 1983
H. L. Chapman and S. A. Stern (Syracuse Univ., N.Y.) Oct. 1983 68 p refs Sponsored by Gas Research Inst.
(PB84-160977; GRI-84/0001) Avail: NTIS HC A04/MF A01 CSCL 07D

A series of silicone polymers with systematic structural variations has been synthesized. In the series (RCH3Si0), where R is CxH(2x+1), the permeability coefficient for all gases tested decreases with increasing size of the alkyl (R) group. This effect is attributed to decreasing chain mobility and flexibility due to the bulkier substituent groups. Polymethylethylsiloxane is an exception to this general trend; having a permeability coefficient less than that of polymethylpropylsiloxane. The relative permeability coefficients are also a function of the organic substituents of the silicone backbone. For example, the ideal separation factor for methane-helium is 2.3 for polymethylpropylsiloxane And 0.76 for polymethyltrifluoropropylsiloxane. Two of the polymers posses oxygen-nitrogen selectivities which are typically high for rubbery polymers. GRA

N84-23772# United Nations Industrial Development Organization, Vienna (Austria).
CERAMIC GLAZES: BASIC INFORMATION
Z. A. Engelthaler 1 Nov. 1983 28 p refs
(PB84-150663; UNIDO/IO.563) Avail: NTIS HC A02/MF A01 CSCL 11B

The report covers: (1) development of modern glazes, (2) raw materials used; other constituents, (3) glaze compositions, (4) colored glazes; and ceramic stains. GRA

N84-23773# National Bureau of Standards, Washington, D.C.
POLYMER SCIENCE AND STANDARDS DIVISIONS REPORT, 1983 Annual Report, 1983
L. E. Smith, M. G. Broadhrst, G. T. Davis, F. W. Wang, and B. M. Fanconi Jan. 1984 114 p refs
Avail: NTIS HC A06/MF A01 CSCL 11H

An evergrowing number of humanity's needs are served by polymers. The volume currently produced exceeds that of steel and forms the basis of industries which add over $106 billion of value by manufacturer (a measure of the relative economic importance of manufacturing among industries) and provides 3.3 million jobs. Recent summaries show that polymers and polymer composites research already accounts for about 47 percent of the total industrial R&D expenditure for metals, polymers, and inorganic materials. Among these materials, polymers also constitute about 40 percent of the value added by manufacturer, 45 percent of the jobs, 49 percent of the number of scientific publications, and 42 percent of the American Society for Testing and Materials (ASTM) standards. GRA

N84-23696# Joint Publications Research Service, Arlington, Va.
SWEDISH ACTIVITIES IN NEW CERAMIC MATERIALS, PROCESSES
Leif Hermansson and Roger Carlsson *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-013) 24 Apr. 1984 p 3-7 refs Transl. into ENGLISH from Kem. Tidskr. (Sweden), Jan. 1984 p 37-38; 40; 42 (For primary document see N84-23694 14-23)
Avail: NTIS HC A03/MF A01

N84-23806# Joint Publications Research Service, Arlington, Va.
NEW ACID-PROOF PROTECTIVE COATING Abstract Only
Waldemar Reszniak and Larisa Smirnowa *In its* East Europe Rept.: Sci. Affairs (JPRS-ESA-84-009) 21 Mar. 1984 p 20-21 Transl. into ENGLISH from Polish Eng. (Warsaw), no. 4, Apr. 1983 p 31 (For primary document see N84-23802 14-31)
Avail: NTIS HC A03/MF A01

N84-23893*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
IMPORTANCE AND DEFINITION OF MATERIALS IN TRIBOLOGY. STATUS OF UNDERSTANDING
Donald H. Buckley *In its* Tribology in the 80's. Vol. 1 Apr. 1984 p 19-44 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01 CSCL 11H

N84-23899*# Virginia Polytechnic Inst. and State Univ., Blacksburg.
THE INFLUENCE OF SURFACE TOPOGRAPHY ON POLYMER FRICTION
Norman S. Eiss, Jr. *In* NASA Lewis Research Center Tribology in the 80's. Vol. 1 Apr. 1984 p 177-186 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01 CSCL 11G

N84-23900*# Tokyo Inst. of Tech. (Japan).
FUTURE DIRECTION OF RESEARCH IN WEAR AND WEAR RESISTANT MATERIALS. STATUS OF UNDERSTANDING
T. Sasada *In* NASA Lewis Research Center Tribology in the 80's. Vol. 1 Apr. 1984 p 197-218 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01 CSCL 11G

N84-23902*# Kanazawa Univ. (Japan).
STRUCTURES AND PROPERTIES OF POLYMERS IMPORTANT TO THEIR WEAR BEHAVIOR
Kyuichiro Tanaka *In* NASA Lewis Research Center Tribology in the 80's. Vol. 1 Apr. 1984 p 253-285 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01

N84-23905*# Pennsylvania State Univ., University Park.
STATUS OF NEW DIRECTION OF LIQUID LUBRICANTS
E. E. Klaus *In* NASA Lewis Research Center Tribology in the 80's. Vol. 1 Apr. 1984 p 367-389 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01 CSCL 11H

N84-23907*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THERMAL AND OXIDATIVE STABILITIES OF LIQUID LUBRICANTS
William R. Jones, Jr. *In its* Tribology in the 80's. Vol. 1 Apr. 1984 p 419-455 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01 CSCL 11H

N84-23908*# Tokyo Inst. of Tech. (Japan).
BEHAVIORS OF POLYMER ADDITIVES UNDER EHL AND INFLUENCES OF INTERACTIONS BETWEEN ADDITIVES ON FRICTION MODIFICATION
Toshio Sakurai *In* NASA Lewis Research Center Tribology in the 80's. Vol. 1 Apr. 1984 p 459-475 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01 CSCL 11H

N84-23909*# California Univ., San Diego.
WHAT'S SO HOT ABOUT FORMULATED SYNTHETICS?
Alan Beerbower *In* NASA Lewis Research Center Tribology in the 80's. Vol. 1 Apr. 1984 p 477-488 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01 CSCL 11H

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N84-23774*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
GROUP-TYPE HYDROCARBON STANDARDS FOR HIGH-PERFORMANCE LIQUID CHROMATOGRAPHIC ANALYSIS OF MIDDISTILLATE FUELS
Dumas A. Otterson and Gary T. Seng May 1984 18 p refs
(NASA-TP-2317; E-1931; NAS 1.60:2317) Avail: NTIS HC A02/MF A01 CSCL 21D

A new high-performance liquid chromatographic (HPLC) method for group-type analysis of middistillate fuels is described. It uses a refractive index detector and standards that are prepared by reacting a portion of the fuel sample with sulfuric acid. A complete analysis of a middistillate fuel for saturates and aromatics (including the preparation of the standard) requires about 15 min if standards for several fuels are prepared simultaneously. From model fuel studies, the method was found to be accurate to within 0.4 vol% saturates or aromatics, and provides a precision of + or - 0.4 vol%. Olefin determinations require an additional 15 min of analysis time. However, this determination is needed only for those fuels displaying a significant olefin response at 200 nm (obtained routinely during the saturated/aromatics analysis procedure). The olefin determination uses the responses of the olefins and the corresponding saturates, as well as the average value of their refractive index sensitivity ratios (1.1). Studied indicated that, although the relative error in the olefins result could reach 10 percent by using this average sensitivity ratio, it was 5 percent for the fuels used in this study. Olefin concentrations as low as 0.1 vol% have been determined using this method. Author

N84-23775*# Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
FLAME PROPAGATION IN HETEROGENEOUS MIXTURES OF FUEL DROPS AND AIR Final Report
G. D. Myers and A. H. Lefebvre May 1984 2057 p refs
(Grant NAG3-266; Contract DE-AI01-81CS-50006)
(NASA-CR-174644; DOE/NASA/0266-1; NAS 1.26:174644) Avail: NTIS HC A04/MF A01 CSCL 21D

Photographic methods are used to measure flame speeds in flowing mixtures of fuel props and air at atmospheric pressure. The fuels employed include a conventional fuel oil plus various blends JP 7 with stocks containing single-ring and mullti-ring aromatics. The results for stoichiometric mixtures show that flame

propagation cannot occur in mixtures containing mean drop sizes larger than 300 to 400 microns, depending on the fuel type. For smaller drop sizes, down to around 60 microns, flame speed is inversely proportional to drop size, indicating that evaporation rates are limiting to flame speed. Below around 60 microns, the curves of flame speed versus mean drop size flatten out, thereby demonstrating that for finely atomized sprays flame speeds are much less dependent on evaporation rates, and are governed primarily by mixing and/or chemical reaction rates. The fuels exhibiting the highest flame speeds are those containing multi-ring aromatics. This is attributed to the higher radiative heat flux emanating from their soot-bearing flames which enhances the rate of evaporation of the fuel drops approaching the flame front. Author

N84-23776# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
NON-STEADY COMBUSTION OF COMPOSITE SOLID PROPELLANTS Final Research Progress Report, 1 Mar. - 30 Sep. 1982
N. S. Cohen and L. D. Strand May 1983 14032 p
(Grant AF-AFOSR-ISSA-82-00030; AF Proj. 2308)
(AD-A139182; JPL-D-708; AFOSR-84-0167TR) Avail: NTIS HC A03/MF A01 CSCL 21/9

An analytical model for the linearized velocity-coupled combustion response function was developed. The model combines elements of response to velocity perturbations, pressure perturbations, and compositional perturbations due to the heterogeneity of composite propellants. The important effects of AP size distribution are accounted for in terms of effects on ballistics properties and in terms of periodic fluctuations in propellant composition. Properties of the response function have been calculated theoretically over a range of the governing variables. There are two facets of the crossflow problem: the response to velocity perturbations, and the effect of crossflow velocity on the various response elements. The crossflow mechanism is heuristically based upon the so-called 'Soderholm erosive burning law,' but which has been given physical significance in the theoretical work of Kuo. Significant results are described. In addition, the triggered non-linear instability experiments performed at CARDE were reviewed and shown to depend upon the achievement of a formulation-dependent critical velocity in the rocket motor. Progress was made in the measurement of the pressure-coupled response functions of propellants formulated to seek out the effects of AP particle size. Progress was made toward formulating a high frequency combustion response model applicable to nitramine/minimum-smoke propellants. GRA

N84-23777# Ogden Air Logistics Center, Hill AFB, Utah. Propellant Analysis Lab.
SURVEILLANCE REPORT. STAGE I DISSECTED MOTORS. PHASE XIV. PROPELLANT AND COMPONENT TESTING Semiannual Report
J. A. Thompson Dec. 1983 14121 p
(AD-A139201; MANPA-482(83)) Avail: NTIS HC A06/MF A01 CSCL 21/9

Testing was performed to determine the useful shelf/service life for LGM-30 Stage I rocket motors. A three year storage program for propellant and components was started in May 1961. This program was then extended to a 10-year study and later continued indefinitely to assure that a deteriorization in motor physical characteristics could be detected in time to take some corrective actions before the weapon system performance deteriorated below an acceptable level. This report covers propellant data and limited case bond data. Malfunction of an environmental chamber destroyed component samples that had originally been part of this testing program (and the inadvertent burning of some motors during dissection reduced the material available for testing). Planned dissection of selected motors in the future will provide samples for continued component testing. A new technique of Multi-symbol Regression Analysis was used to determine aging trends. Using a unique plotting code for each motor tested demonstrates the relationship between motors and block propellant. From the statistical analysis of all data tested to date, significant degradation of the propellant does not appear likely for at least two years past the oldest data point. Future testing will be conducted on dissected motors. GRA

N84-23778# Texas Univ., Austin. Dept. of Physics.
THEORETICAL STUDIES OF SOLIDS UNDER EXTREME CONDITIONS Annual Scientific Report, 1 Dec. 1982 - 31 Nov. 1983
J. L. Fry, G. Fletcher, and A. K. Ray Dec. 1983 16 p
(Grant AF-AFOSR-0050-83; AF Proj. 2301)
(AD-A139352; AFOSR-84-0158TR) Avail: NTIS HC A02/MF A01 CSCL 19/1

During the period Dec. 1, 1982 to Nov. 31, 1983 theoretical studies of energetic solids and solids at low temperature began. Major state-of-the-art quantum chemistry codes were implemented for the task of determining activation energies of explosive molecules and solids. Extensive studies of the R-NO2 molecular species concluded the most previous work based upon a single determinant wave function is wrong: even the ground state of these molecules required a multi-configurational description. The generalized valence bond method has been employed successfully to describe a large number of molecules and offers hope of understanding some of the much more complex energetic molecules which are important because of their general use. Studies of the electron phonon interaction have resulted in a new, efficient formulation of the problem. Theoretical prediction of the superconducting transition temperature base upon accurate description of the electron phonon interaction has been completed for a number of transition metals and their alloys. Studies of surface superconductivity and investigation of coherent radiation from molecules at solid surfaces have also begun. Author (GRA)

N84-23779# Ammann and Whitney, New York.
ON-SITE SURVEY AND ANALYSIS OF PYROTECHNIC MIXER BAYS Interim Technical Report
D. Kossover and N. Dobbs Dover, N.J. Army Armament Research and Development Center Feb. 1984 37 p
(Contract DAAK10-82-C-0138)
(AD-A139485; AD-E401141; ARLCD-CR-84001) Avail: NTIS HC A03/MF A01 CSCL 19/1

Pyrotechnic accidents, some fatal, have occured at several pyrotechnic manufacturing facilities indicating that operator exposure to these operations must be improved. To cover the various aspects, the project was divided into the following four areas: mixer safety, transport and conveying safety, fire suppression system, and bay design safety. This report covers the bay design safety which is concerned with the on-site survey of the five pyrotechnic facilities: Longhorn Army Ammunition Plant (AAP), Lone Star AAP, Pine Bluff Arsenal, Crane Army Ammunition Activity, and Lake City AAP. GRA

N84-23780# Rocketdyne, Canoga Park, Calif. Energy Systems Group.
PRODUCTION OF HYDROGEN FROM RENEWABLE RESOURCES Final Subcontract Report
A. J. Darnell, L. R. McCoy, G. Bauerle, and K. M. Barcaly Dec. 1983 77 p refs
(Contract DE-AC02-83CH-10093)
(DE84-000082; SERI/STR-231-1875) Avail: NTIS HC A05/MF A01

This report presents results from an experimental program to investigate the use of a bromination process to produce hydrogen from biomass. Biomass is reacted with bromine and water, forming hydrobromic acid, which is then electrolyzed to form hydrogen and bromine. Bromination reaction tests showed that agitation has essentially no effect on the bromine-wood reaction rate. Also, the reaction rate is independent of the entire range of HBr concentration (34 to 60 wt %) considered as the feed to the electrolysis cell. Some preliminary tests conducted on aerobic sludge indicated that some sludge may contain a fraction very refractory to bromination; however, the major fraction of the sludge reacted rapidly. Studies of the electrolysis of aqueous HBr solutions showed that an IR-free working voltage of about 0.6 V is attainable (less than one-third the voltage required for electrolysis of water). The

effect of platinum catalyst loading on the overvoltage of the graphite negative electrode was measured using a 47.5 wt % HBr solution at 25C; the optimum Pt loading factor was approximately 0.5 mg/sq cm. DOE

N84-23781# Bonner and Moore Associates, Inc., Houston, Tex.
IMPACT ASSESSMENT OF REDUCING GASOLINE VOLATILITY Final Report
Franklin P. Frederick 30 Nov. 1983 197 p Sponsored by California Air Resources Board, Sacramento
(PB84-152024; ARB-R-84-220) Avail: NTIS HC A09/MF A01 CSCL 21D

This report documents a study of the potential impacts of hydrocarbon emissions, on vehicle performance and on refining operations, investments and costs of restricting volatility of gasoline sold in California during the summer. Current volatility limits require a Reid vapor pressure of no more than 9 psia. Assessments of impacts were made for restrictions of 8, 7 and 6 psia fuels in two future situations based on 185 and 1990 crude and product forecasts. Results cover emissions effects in terms of vehicular evaporative losses. Vehicle performance effects are defined in terms of cold start, warm-up, driveability and safety considerations. Industry-level refining costs are developed in terms of raw material, capital and operating components. Typical refining situations are also examined. Author (GRA)

N84-23782# Agricultural Research Service, Peoria, Ill. Regional Research Center.
VEGETABLE OIL AS DIESEL FUEL: SEMINAR 3
Marvin O. Bagby, ed. and Everett H. Pryde, ed. 1983 192 p refs Seminar held in Peoria, Ill., 19-20 Oct. 1983
(PB84-151323; ARM-NC-28; ISSN-0193-3787) Avail: NTIS HC A09/MF A01 CSCL 21D

Petroleum formation through the conversion of organic matter into hydrocarbons as catalyzed by clay had been proposed for some time. An objection to this theory arose when it was realized that envelopes of water entrapped the clay particles in their natural state. The water was thought to impair the catalytic action. In a recent study of the conversion of ethanol to gasoline, the authors found that water actually promoted the conversion over a synthetic aluminum silicate catalyst, ZSM-5. Whether such promotion is applicate catalyst, ZSM-5. Whether such promotion is applicable to the clay, a natural aluminum silicate, is an important issue in petroleum genesis. GRA

N84-23783*# National Academy of Sciences - National Research Council, Washington, D. C. Ad Hoc Committee on R&D Test Fuels.
PROVIDING R AND D (RESEARCH AND DEVELOPMENT) TEST FUELS FROM ALTERNATE ENERGY SOURCES: AN ASSESSMENT OF OPTIONS
Sep. 1983 88 p refs Sponsored in part by U.S. Air Force (Contract NASw-3455)
(NASA-CR-173427; NAS 1.26:173427; PB84-164045) Avail: NTIS HC A05/MF A01 CSCL 21D

There is a definite need for a variety of synthetic mobility test fuels to support on-going and planned engine/fuel interaction research and development programs. Provision of adequate supplies of such fuels requires a well-managed and coordinated program supported by a dedicated, highly flexible facility capable of producing such fuels as required on a timely and economical basis. The program should be managed by a single authority within DOD, responsible for coordinating test-fuel requirements of R&D organizations of the military and other government agencies. The program manager should develop plans for production and procurement of R&D synthetic test fuels and arrange for implementation of those plans and be aware of progress in the synfuels industry. GRA

N84-23784# Joint Publications Research Service, Arlington, Va.
EAST EUROPE REPORT: SCIENCE AND TECHNOLOGY
2 May 1984 44 p refs Transl. into ENGLISH from various East German and Hungarian articles
(JPRS-ESA-84-012) Avail: NTIS HC A03/MF A01

The microelectronics industry in Hungary and the German Democramatics Republic is discussed with emphasis on training and production. The use of methanol as a motor vehicle fuel is assessed. For individual titles, see N84-23785 through N84-23785.

N84-23785# Joint Publications Research Service, Arlington, Va.
METHANOL VIEWED AS ALTERNATIVE TO GASOLINE
M. Wobst *In its* East Europe Rept.: Sci. and Technol. (JPRS-ESA-84-012) 2 May 1984 p 6-22 refs Transl. into ENGLISH from KFT-Kraftfahrzeugtechnik (East Berlin), no. 3, Mar. 1984 p 70-74 (For primary document see N84-23784 14-28)
Avail: NTIS HC A03/MF A01

Methanol can be used as a fuel in both diesel and gasoline engines. A gradual admixture of methanol as a mixed fuel proves to be the most effective method. Problems with mixture stability and reliability in cold weather can be resolved with suitable solvent agents. Methanol resistant materials in the fuel system are required. A.R.H.

N84-23631*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TRENDS OF JET FUEL DEMAND AND PROPERTIES
Robert Friedman *In its* Assessment of Alternative Aircraft Fuels Apr. 1984 p 1-10 refs (For primary document see N84-23630 14-07)
Avail: NTIS HC A09/MF A01 CSCL 21D

N84-23632*# Exxon Research and Engineering Co., Linden, N.J.
THE EFFECT OF PROPERTY CHANGES ON JET FUEL PRODUCIBILITY AND COST
G. M. Varga, Jr., A. R. Cunningham, J. F. Gorgol, A. J. Graf, and G. A. Oliver *In* NASA. Lewis Research Center Assessment of Alternative Aircraft Fuels Apr. 1984 p 11-22 (For primary document see N84-23630 14-07)
Avail: NTIS HC A09/MF A01 CSCL 21D

N84-23633*# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
USAF SHALE OIL PROGRAM STATUS
Charles L. Delaney *In* NASA. Lewis Research Center Assessment of Alternative Aircraft Fuels Apr. 1984 p 23-30 (For primary document see N84-23630 14-07)
Avail: NTIS HC A09/MF A01 CSCL 21D

N84-23642*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RESEARCH ON AVIATION FUEL INSTABILITY
Charles E. Baker, David A. Bittker, Stephen M. Cohen, and Gary T. Seng *In its* Assessment of Alternative Aircraft Fuels Apr. 1984 p 121-130 refs (For primary document see N84-23630 14-07)
Avail: NTIS HC A09/MF A01 CSCL 21D

N84-23643*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
IN-FLIGHT ATMOSPHERIC AND FUEL TANK TEMPERATURE MEASUREMENTS
Roger Svehla *In its* Assessment of Alternative Aircraft Fuels Apr. 1984 p 131-140 refs (For primary document see N84-23630 14-07)
Avail: NTIS HC A09/MF A01 CSCL 21D

N84-23647*# Southwest Research Inst., San Antonio, Tex.
FUEL PROPRTY EFFECTS ON NAVY AIRCRAFT FUEL SYSTEMS
C. A. Moses *In* NASA. Lewis Research Center Assessment of Alternative Aircraft Fuels Apr. 1984 p 185-190 (For primary document see N84-23630 14-07)
Avail: NTIS HC A09/MF A01 CSCL 21D

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N84-23785*# National Aeronautics and Space Administration, Washington, D. C.
THE ROLE OF WATER IN SLIP CASTING
R. A. McCauley and G. W. Phelps May 1984 36 p refs Transl. into ENGLISH from Keramische Z. (West Germany), v. 33, no. 3 and no. 5, 1981 p 148-151; 275-277; 295
(NASA-TM-77578; NAS 1.15:77578) Avail: NTIS HC A03/MF A01 CSCL 13H

Slips and casting are considered in terms of physical and colloidal chemistry. Casting slips are polydisperse suspensions of lyophobic particles in water, whose degree of coagulation is controlled by interaction of flocculating and deflocculating agents. Slip casting rate and viscosity are functions of temperature. Slip rheology and response to deflocculating agents varies significantly as the kinds and amounts of colloid modifiers change. Water is considered as a raw material. Various concepts of water/clay interactions and structures are discussed. Casting is a de-watering operation in which water moves from slip to cast to mold in response to a potential energy termed moisture stress. Drying is an evaporative process from a free water surface. Author

N84-23787# Naval Weapons Center, China Lake, Calif.
AN EVALUATION OF PERMANENT SOLDER MASKS FOR HIGH RELIABILITY APPLICATIONS Final Report, 1981 - 1983
D. J. Sanger Feb. 1984 81 p
(AD-A139234; AD-E900330; NWC-TP-6517) Avail: NTIS HC A05/MF A01 CSCL 13/8

With more dense packaging of electronic subassembly printed wiring boards, it has become necessary for the military to fully understand materials and application problems of solder mask. This project was an attempt to experience and understand the problems associated with dry film and liquid permanent solder masks. Items such as registration, adherence, bubbles and voids, and environmental protection were examined. The result was a better understanding of each of these problems with conclusions that solder mask should be used only over bare copper circuitry and that liquid solder mask should not be used as an electrical insulating barrier. GRA

N84-23788# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
LOAD-TRANSFER CRITERIA FOR NUMERICAL ANALYSIS OF AXIALLY LOADED PILES IN SAND. PART 1: LOAD-TRANSFER CRITERIA Final Report
R. L. Mosher Jan. 1984 390 p
(AD-A139236; WES-TR-K-84-1) Avail: NTIS HC A17/MF A01 CSCL 13/13

Part I describes a study of load-transfer criteria for analysis of axially loaded piles in sand using the discrete springs soil model. Various analysis methods for axially loaded piles are presented, along with a literature review of pile behavior in sands focusing on the changes the soil undergoes during pile installation. Available criteria for spring representation of soil are presented and summarized. The criteria are compacted with actual field data from pile load tests and are critically evaluated based on these comparisons. Because of the poor performance of the available criteria, new criteria are proposed. The new criteria use maximum side and tip resistance values presented by Castello (1980). Castello's values are modified by the author to reflect the field data from the Lower Mississippi Valley. Displacement functions for side and tip resistance are developed based on correlations with field data for pile load tests. The new criteria are evaluated against pile load test data. Use of the criteria is demonstrated in an outline of an analysis. The new criteria are used to develop a set of design curves for the practicing engineer. Part II of this report is published under a separate cover, and presents load capacity curves for select steel and concrete pile. GRA

N84-23789# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
COMPUTER APPLICATIONS TO GEOTECHNICAL ENGINEERING M.S. Thesis
D. K. Eddy Aug. 1983 231 p
(AD-A139271; AFIT/CI/NR-83-86T) Avail: NTIS HC A11/MF A01 CSCL 13/2

This report presents four geotechnical engineering programs for use on personal computing systems. An Apple II-Plus operating with DOS 3.3 Applesoft language was used. The programs include the solution of the signpost problem, the cantilevered sheet pile problem, the slope stability problem, and the flexible pavement design program. Each chapter is independent and does not rely upon theories or data presented in other chapters. A chapter outlines the theory used and also presents a users guide, a program list, and verification of the program by hand calculation. This report assimilates the product a practicing engineer would expect to receive when procuring software services. GRA

N84-23790# Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
CONSTITUTIVE MODELS FOR STATIC AND DYNAMIC RESPONSE OF GEOTECHNICAL MATERIALS Final Scientific Report, 1 Oct. 1979 - 30 Sep. 1983
S. Nemat-Nasser Nov. 1983 276 p
(Grant AF-AFOSR-0017-80; AF Proj. 2307)
(AD-A139293; AFOSR-84-0161TR) Avail: NTIS HC A13/MF A01 CSCL 08/13

The objective of this research program has been to develop realistic macroscopic constitutive relations which describe static and dynamic properties of geotechnical materials (soils and rocks). To this end a coordinated theoretical and experimental activity has been followed. The theoretical work includes a balanced combination of statistical microscopic (at the grain size level) modeling and a nonclassical elasto-plastic macroscopic formulation. The latter includes the effects of internal friction, plastic compressibility, and pressure sensitivity, as well as anisotropy which is commonly observed in geotechnical materials. The following specific goals have been sought: (1) to develop three-dimensional constitutive relations under ordinary or high pressures (such as those induced by blasting or tectonic forces which may cause a large amount of densification by relative motion and possible crushing of grains); and (2) to examine and characterize the behavior of saturated granular materials under dynamic loading. The latter item includes characterization of possible liquefaction and subsidence which may be induced in granular materials under confining pressure by ground vibration or passage of waves. The theoretical work has been carefully coordinated with key experiments in order to: (1) understand the basic physics of the process, both at macroscopic and microscopic levels; (2) to verify the corresponding theoretical predictions; and (3) to establish relevant material parameters. GRA

N84-23791# Applied Research Association, Inc., Albuquerque, N. Mex.
FUNDAMENTAL PROPERTIES OF SOILS FOR COMPLEX DYNAMIC LOADINGS; DYNAMIC CONSTITUTIVE MODEL FUNDAMENTALS Annual Technicl Report, 1 Aug. 1982 - 31 Jul. 1983
D. H. Merkle and W. D. Dass 1 Dec. 1983 125 p
(Contract F49620-80-C-0088; AF Proj. 2307)
(AD-A139358; AFOSR-84-0166TR; ATR-3) Avail: NTIS HC A06/MF A01 CSCL 08/13

This report discussed the physical basis for the equations describing the dynamic response of a saturated soil. Next, the principal stress-strain features which a soil constitutive model may have to reproduce are reviewed. Finally, the basic equations of elastoplasticity are derived, existing failure criteria are reviewed, and a new failure criterion is presented. GRA

N84-23792# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SLIP FORMS FOR THE CONSTRUCTION OF PRESSED CAST-IN-SITU CONCRETE LININGS FOR SHIELD TUNNELING

F. T. Skuybin, F. Dushenko, and V. N. Korolkov 29 Feb. 1984 11 p Transl. into ENGLISH from Osnovaniya, Fundamenty i Mekhan. Gruntov (USSR), no. 2, 1972 p 25-27
(AD-A139411; FTD-ID(RS)T-1816-83) Avail: NTIS HC A02/MF A01 CSCL 13/8

The advantages of pressed cast-in-situ concrete linings over precast concrete linings for shield tunneling are discussed. The experience in employing rigid slip forms has revealed a number of deficiencies in them. This document is concerned with making the construction and design of slip forms more efficient. B.W.

N84-23793# Department of Energy, Washington, D. C. Office of the Assistant Secretary for Policy, Safety and Environment.
STANDARD FOR FIRE PROTECTION OF DOE ELECTRONIC COMPUTER/DATA PROCESSING SYSTEMS
Jan. 1984 35 p
(DE84-007194; DOE/EP-0108) Avail: NTIS HC A03/MF A01

The standard which applies to all essential electronic computer data processing equipment and the storage facilities, associated utilities, and air conditioning systems is outlined. The types of construction necessary for a computer building and computer rooms are described, which includes location and perimeter separation anc certain operating requirements. Fire protection systems that may be employed for computer equipment protection are described. The necessary utilities required in a computer area and the emergency controls required for shutdown of these utilities and the types of storage and records and the protection required for each type are discussed. Specific requirements are listed unique to mobile equipment. Emergency operations programs for fire-fighting and for the restoration of damaged records are described. DOE

N84-23794# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Information und Documentation.
PLANNING AND IMPLEMENTATION OF AUTOMATED CUTTING IN THE PRECISION ENGINEERING INDUSTRY [PLANUNG UND REALISIERUNG EINER AUTOMATISIERTEN ZERSPANUNG IN EINEN BETRIESS DER FEINWERKTECHNISCHEN INDUSTRIE]
Blankenagel, Weyand, and Brodbeck 1983 30 p In GERMAN Presented at Inst. fuer Arbeit, Wirtsch. u. Organ. (IAO) Tagung, Boeblingen, West Ger., Nov. 1983
(MBB-UA-772-83-O) Avail: NTIS HC A03/MF A01

Production planning of a computer aided cutting process is described. Precision components, mainly made of aluminum, are provided in small or medium numbers. Starting out from a work piece analysis, the machine structure, material flow, and course organization are planned. The planning steps are determined on the basis of planning priorities. Qualitative and quantitative results (fewer machines, fewer personnel, faster production, production optimization, higher flexibility, and better quality) are presented. Author (ESA)

N84-23795# Coors Porcelain Co., Golden, Colo.
CERAMIC TUBE MATERIALS AND PROCESSING DEVELOPMENT Annual Report, Feb. - Oct. 1982
D. W. Roy, K. E. Green, R. E. Oliver, and M. I. Rivkin Dec. 1983 40 p refs Sponsored by Gas Research Inst.
(PB84-151653; GRI-81/0109) Avail: NTIS HC A03/MF A01 CSCL 13A

Evaluation of state-of-the-art in ceramic recuperator design and application, including the current requirements (specifications) for reaction bonded SiC tubing and a discussion of the perceived joining problem(s), as well as comments on possible solutions are given. Initial examination of low cost raw materials and qualitative discussion of the ceramic produced from selected grades of same, is discussed. GRA

N84-23796# Institute of Gas Technology, Chicago, Ill.
GAS-FIRED HEAT PUMP RESEARCH AND DEVELOPMENT: REVIEW AND ASSESSMENT Final Report, Sep. 1981 - Feb. 1983
John A. Kinast and Jaroslav Wurm Dec. 1983 194 p refs Sponsored by Gas Research Inst.
(PB84-153907; GRI-83/0027) Avail: NTIS HC A09/MF A01 CSCL 13A

Three categories of heat pump systems were identified. The first category is of systems that are well understood, but require further refinement to develop a feasible air conditioner or heat pump. This category includes internal combustion engine-based systems, Stirling-based (and similar) systems, and adsorption and absorption systems. The second category includes systems that are well understood but have reached established thermodynamic limits. Ejector systems are in this category. The third category consists of systems that show promise, but need further knowledge of fundamental operating principles to be developed. Magnetic and thermoelectric systems are in this category. Findings show that successful production and marketing requires the fully committed participation of researchers, manufacturers, and gas utilities. Author (GRA)

N84-23797# Spencertown Geo-Solar Associates, N.Y.
GROUND-COUPLED HEAT PUMP DEMONSTRATION
Thomas OConnell Sep. 1983 72 p refs
(PB84-156223; NYSERDA-83-20) Avail: NTIS HC A04/MF A01 CSCL 13A

The results of a field evaluation of an innovative ground-coupled heat pump system which features a unique collector design and system control strategy aimed at maximizing heat pump performance by minimizing ground temperature change is discussed. The collector design includes several short closed loops, each consisting of a pair of polyethylene pipes buried 12 to 18 inches apart in a horizontal trench approximately six feet below ground. A micropressor is used to control flow and optimize system operation. Extrapolation of the results of experiments conducted on a unit length (250 ft.) of collector field during the 1981-82 and 1982-83 heating seasons indicates that a system seasonal performance factor of 2.75 to 3.0 will be achievable in practice. Author (GRA)

N84-23798# Transportation Research Board, Washington, D.C.
CRITERIA FOR USE OF ASPHALT FRICTION SURFACES Final Report
Woodrow J. Halstead, Thomas L. Copas, Herbert A. Pennock, and Anne Shipman, ed. Nov. 1983 52 p refs
(PB84-155613; TRB/NCHRP/SYN-104; ISBN-0-309-03565-1; ISSN-0547-5570; LC-83-51531) Avail: NTIS HC A04/MF A01 CSCL 13C

Upgrading pavements by application of asphalt friction surfaces is discussed. Guidelines are presented for deciding when it is appropriate to use various types of friction courses. The most common types of asphalt surfaces used to upgrade frictional characteristics of pavements are seal coats, open-graded mixes, and dense graded mixes. Information is given on current engineering practices, legal and regulatory considerations, and criteria for selection of appropriate types of asphalt friction courses. GRA

N84-23799# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
4 Jan. 1984 59 p refs Transl. into ENGLISH from various West European articles
(JPRS-WST-84-001) Avail: NTIS HC A04/MF A01

The current status and technological progress made in the automobile industry, microelectronics, factory automation, aerospace industry and computer field are examined. Subjects on production methods, composite materials, sales, finance, and factory modernization are discussed. Particular emphasis is placed on technology forecasting as it effects manufacturing techniques. For individual titles, see N84-23800 through N84-23801.

N84-23800# Joint Publications Research Service, Arlington, Va.
SAAB CLAIMS WORLD'S MOST MODERN ENGINE-ASSEMBLY PLANT
Ulf Bergmark *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-001) 4 Jan. 1984 p 2-11 Transl. into ENGLISH from NY Tek. (Sweden), 13 Oct. 1983 p 30-31 (For primary document see N84-23799 14-31)

Avail: NTIS HC A04/MF A01

The modernization of an engine assembly plant using computer aided manufacturing techniques and robotics is described. The development of associated tools and production procedures used to assemble the Light Component Project (LCP) modular automobile are discussd. Structural design criteria used to reduce the weight and increase the fuel efficiency of the vehicle are explained. M.A.C.

N84-23801# Joint Publications Research Service, Arlington, Va.
VOLVO LCP: NEW MATERIALS, PRODUCTION METHODS
Ulf Bergmark *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-001) 4 Jan. 1984 p 12-22 Transl. into ENGLISH from NY Tek. (Sweden), 20 Oct. 1983 p 36-37 (For primary document see N84-23799 14-31)
Avail: NTIS HC A04/MF A01

The materials and production methods developed for the prototype Light Component Project are described. The forecasting of auto industry technology as it effects engine and structural design, vehicle construction materials, and vehicle assembly is included with particular emphasis on computer aided manufacture and robotics used on an engine assembly line. M.A.C.

N84-23802# Joint Publications Research Service, Arlington, Va.
EAST EUROPE REPORT: SCIENTIFIC AFFAIRS
21 Mar. 1984 48 p Transl. into ENGLISH from various East European articles
(JPRS-ESA-84-009) Avail: NTIS HC A03/MF A01

Recent developments in science and technology are outlined in this document Subject matter covered includes: integrated circuit technology; environment protection and pollution; specialized minicomputer systems; infrared radiation detectors; and acid-proof protective coatings. For individual titles, see N84-23803 through N84-23806.

N84-23803# Joint Publications Research Service, Arlington, Va.
NEW DEVELOPMENTS IN SCIENCE, TECHNOLOGY DESCRIBED. SPECIALIZED GEO-20 MINICOMPUTER SYSTEM Abstract Only **c60**
In its East Europe Rept.: Sci. Affairs (JPRS-ESA-84-009) 21 Mar. 1984 p 17 Transl. into ENGLISH from Polish Eng. (Warsaw), no. 3, Mar. 1984 p 4 (For primary document see N84-23802 14-31)
Avail: NTIS HC A03/MF A01

The Institute of Information Science of the Technical University of Warsaw has developed, in cooperation with the Computer Centre for Geodesy and Cartography, the GEO-20 specialized minicomputer system designed for performing geodetic calculations and managing the operation of surveying enterprises. The coupling of the specialized geodetic software with a data logger and data processing systems has provided a comprehensive solution to most computational problems met with in surveying enterprises. The dedicated equipment and specialized geodetic software allow the application of the GEO-20 minicomputer system in a way giving an entirely new quality to the work being done by surveying enterprises. B.W.

N84-23804# Joint Publications Research Service, Arlington, Va.
NEW INTEGRATED CIRCUIT TECHNOLOGY Abstract Only **c33**
In its East Europe Rept.: Sci. Affairs (JPRS-ESA-84-0090 21 Mar. 1984 p 18-19 Transl. into ENGLISH from Polish Eng. (Warsaw), no. 3, Mar. 1983 p 7 (For primary document see N84-23802 14-31)
Avail: NTIS HC A03/MF A01

The manufacture of bipolar or MOS integrated circuits requires the connection of the structure contact fields (10 - 64 contacts) with the corresponding contacts of the pack. These connections are made using sections of gold wire with a diameter of 25 or 38 micrometers whose ends are generally welded together by the thermocompensation technique. This connecting operation is very labour consuming. In order to optimize that operation and to develop a technology speeding it up, a special research project was launched at the Industrial Institute of Electronics. B.W.

N84-23805# Joint Publications Research Service, Arlington, Va.
FIRST INFRARED RADIATION DETECTOR Abstract Only **c35**
In its East Europe Rept.: Sci. Affairs (JPRS-ESA-84-009) 21 Mar. 1984 p 19-20 Transl. into ENGLISH from Polish Eng. (Warsaw), no. 3, Mar. 1983 p 17 (For primary document see N84-23802 14-31)
Avail: NTIS HC A03/MF A01

The first in the world noncooled photon detector designed for the detection of infrared radiation of wave length 8-12 micrometers (optimized wave length 10.6 micrometers) has been manufactured in the Plasma Physics and Laser. Microsynthesis Institute, in close cooperation with the Technical Military Academy. The 'father' of the technology is Professor Piotrowski from the Technical Military Academy while the construction and idea of utilization of the new instrument stem from the Plasma Physics and Laser Microsynthesis Institute in Warsaw. The elaboration of a new and really sensational technology was the logical outcome of research work carried out in Poland on cadmium-mercury telluride. And it was just on the basis of that new semiconductor that the noncooled infrared radiation detector has been constructed. B.W.

N84-23806# Joint Publications Research Service, Arlington, Va.
NEW ACID-PROOF PROTECTIVE COATING Abstract Only **c27**
Waldemar Reszniak and Larisa Smirnowa *In its* East Europe Rept.: Sci. Affairs (JPRS-ESA-84-009) 21 Mar. 1984 p 20-21 Transl. into ENGLISH from Polish Eng. (Warsaw), no. 4, Apr. 1983 p 31 (For primary document see N84-23802 14-31)
Avail: NTIS HC A03/MF A01

The recently developed acid-proof protective coatings are obtained from a substance made in a simple way from low grade cheap material or production wastes. This influences the manufacturing and application costs of these coatings in relation to traditional materials. B.W.

N84-23563# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Metallische Werkstoffe.
ALUMINUM PRECISION FORGING COMPONENTS [ALGENAUSCHMIEDETEILE]
W. Zink *In its* Develop. and Demonstration of Econ. Production Systems in Aircraft Construct., Part 2, Part 6 Nov. 1983 p 124-147 In GERMAN (For primary document see N84-23555 14-01)
Avail: NTIS HC A08/MF A01

N84-23942# Geological Survey, Washington, D. C.
SURVEYING IN ANTARCTICA DURING THE INTERNATIONAL GEOPHYSICAL YEAR Abstract Only
William H. Chapman *In its* US Geological Survey Polar Res. Symp. 1983 p 6-7 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N84-23807*# Illinois Univ., Urbana-Champaign. Electromagnetics Lab.
THE STUDY OF MICROSTRIP ANTENNA ARRAYS AND RELATED PROBLEMS Semiannual Report, 22 Nov. 1983 - 21 May 1984
R. Q. Lo 25 May 1984 28 p refs
(Contract NAG3-418)
(NASA-CR-173534; NAS 1.26:173534; SAR-2) Avail: NTIS HC A03/MF A01 CSCL 20N

The work on rectangular microstrip antennas for dual frequency operation is reported on. The principle of this approach is based on the excitation of a patch for two or more different modes

which correspond to different frequencies. However, for a given geometry, the modal frequencies have a fixed relationship; therefore, the usefulness of such a design is greatly limited. In this study three different methods have been contrived to control the frequency ratio over a wide range. First, as found prevously, if shorting pins are inserted at certain locations in the patch, the low frequency can be raised substantially. Second, if slots are cut in the patch, the high frequency can be lowered considerably. By using both techniques, the two frequency ratio can be varied approximately from 3 to 1.3. After that, the addition of more pins or slots becomes ineffective. B.W.

N84-23808# Air Force Geophysics Lab., Hanscom AFB, Mass. Optical Physics Div.

O-ATOMS YIELDS FROM MICROWAVE DISCHARGES IN N2O/Ar MIXTURES Interim Scientific Report

L. G. Piper (Physical Science, Inc., Andover, Mass.), W. T. Rawlins (Physical Science, Inc., Andover, Mass.), and R. A. Armstrong 1 Feb. 1983 42 p refs

(AF Proj. 6110)

(AD-A130429; AFGL-TR-83-0031; PSRP-665) Avail: NTIS HC A03/MF A01 CSCL 20/14

The products of Ar/N2O microwave discharges were studied to determine their fitness as sources of atomic oxygen in discharge-flow reactors. For N2O feed rates below 10 to 20 micromol/s, the discharge converts about 75 percent of the N2O to atomic oxygen, and in addition, produces small quantities of atomic nitrogen, generally less than 10% of the O atom product. A kinetic model of the discharge was developed to help explain the experimental observations. The model reproduce the experimental results reasonably well only if the electron impact dissociation of the N2O in the discharge proceeds through a spin forbidden channel to produce O(3p), and if, in addition, about 20% of the N2O dissociations result from collisions between metastable Ar atoms in the discharge and N2O. Author

N84-23809# Air Force Academy, Colo. Dept. of Electrical Engineering.

PROCEEDINGS OF THE 1983 SYMPOSIUM ON MILITARY SPACE COMMUNICATIONS AND OPERATIONS

1983 128 p refs Symp. held in Colorado Springs, Colo., 2-4 Aug. 1983 Sponsored in part by the Rocky Mountain Chapter of the Armed Forces Communication Electronics Association

(AD-A135021) Avail: NTIS HC A07/MF A01 CSCL 17/2

A forum was provided where military and industry could discuss the latest developments emerging in the military space communications and operations. Topics covered included operational concepts/missions; network control/architecture; space system survivability/reliability; space system technology/analysis; DoD command and control centers; policy, strategy and legal aspects of space; and simulation and testing. For individual titles, see N84-23810 through N84-23825.

N84-23810# National Defence Headquarters, Ottawa (Ontario).

SATELLITE TACTICAL COMMUNICATIONS AT HIGH ALTITUDES

K. L. Matheson *In* AF Academy Proc. of the 1983 Symp. on Mil. Space Commun. and Operations 1983 p 5-17 refs (For primary document see N84-23809 14-32)

(AD-P002145) Avail: NTIS HC A07/MF A01 CSCL 17/2

Canada spans about 90 degrees of longitude and has requirements for tactical command and control communications as far north as to at least 84 degrees north latitude. These facts create unique problems when considering requirements for communication by satellite relay. The trend in military satellite communication for tactical purposes is towards the EHF spectrum. For currently practical power aperture levels geostationary EHF satellite communications are not considered likely to be militarily reliable for a country with high latitudes such as Canada. This paper examines the use of inclined elliptic semi-synchronous orbits to solve this problem. It is concluded that a highly elliptic inclined semi-synchronous orbit possesses significant advantages for EHF tactical communications at latitudes common to military operations in the Arctic. Author

N84-23811# OAO Corp., Greenbelt, Md.

AIR OPERATIONS LANGUAGE FOR MILITARY SPACE GROUND SYSTEMS

Phil Davis *In* AF Academy Proc. of the 1983 Symp. on Mil. Space Commun. and Operations 1983 p 21-26 (For primary document see N84-23809 14-32)

(AD-P002146) Avail: NTIS HC A07/MF A01 CSCL 09/2

The trends in military space ground system architecture is toward large amounts of software and more widely distributed processors. At the same time, life cycle cost considerations dictate that fewer personnel with minimized skill levels and knowledge operate and support these systems. This squeeze necessitates more human engineering and operational planning into the design of these systems. Several techniques have been developed to satisfy these requirements. An operations language is one of these techniques. It involves a specially defined syntax for control of the system. Individual directives are able to be grouped into operations language procedures. These procedures can be prepared offline ahead of time by more skilled personnel and then used to ensure repeatability of operational sequences and reduce operator errors. The use of an operations language also provides benefits for the handling of contingency operations as well as in the system testing and validation programs. Author

N84-23812# Kaman Sciences Corp., Colorado Springs, Colo. **c15**

SATELLITE SYSTEM SURVIVABILITY

Frank H. Shelton *In* AF Academy Proc. of the 1983 Symp. on Mil. Space Commun. and Operations 1983 p 29-31 (For primary document see N84-23809 14-32)

(AD-P002147) Avail: NTIS HC A07/MF A01 CSCL 22/2

Present U.S. military capability relies heavily on Earth satellites to maintain connectivity. The essential nature of these satellite systems has made them tempting targets to nuclear attack in wartime. The author reviews U.S. history in high-altitude nuclear device testing and nuclear effects testing on satellies, events in which he directly participated. Physics of the production of nuclear enhanced high-altitude electron belts are reviewed. The author discusses primary affects of the enhanced environment on satellite components. A glimpse into future satellite hardening reveals measures against developing directed energy weapons. Author

N84-23813# North American Air Defense Command, Peterson AFB, Colo. System Control Div.

RELIABILITY IN SPACE: PROGRAM MANAGER AND USER AWARENESS **c38**

Alice J. W. Anderson *In* AF Academy Proc. of the 1983 Symp. on Mil. Space Commun. and Operations 1983 p 33-35 refs (For primary document see N84-23809 14-32)

(AD-P002148) Avail: NTIS HC A07/MF A01 CSCL 05/1

Space systems and satellite communications are now a reality. As these systems become more important to our military missions, we must ensure we have reliable equipment. The role of reliability is not just the responsibility of the project reliability engineer. The program manager and the user must understand the importance of the reliability program. The designers and users must have a mutual understanding of the program goals. If the engineer is the only one who can understand the system, the user will not agree it is what is needed and the program manager will not support the funding requirement. Author

N84-23814# Ford Aerospace and Communications Corp., Colorado Springs, Colo.

THE EVOLUTION OF AIR FORCE SPACE MISSION COMMAND, CONTROL AND COMMUNICATIONS

William N. Blanchard *In* AF Academy Proc. of the 1983 Symp. on Mil. Space Commun. and Operations 1983 p 39-44 (For primary document see N84-23809 14-32)

(AD-P002149) Avail: NTIS HC A07/MF A01 CSCL 17/2

This paper traces the evolution of Air Force space mission command, control, and communications as the Air Force Satellite

Control Facility has matured and as the Space Shuttle becomes operational. The internetting of Air Force and NASA support networks is described, as exemplified by the development of the Consolidated Space Operations Benter. Recent trends toward an evolutionary methodology for acquiring space command and control systems are also discussed. Author

N84-23815# Naval War Coll., Newport, R. I. Center for Advanced Research.
OPERATION OF COMMUNICATIONS SATELLITE SYSTEMS DURING CRISIS AND CONFLICT c15
Robert L. Dickman *In* AF Academy Proc. of the 1983 Symp. on Mil. Space Commun. and Operations 1983 p 45-51 (For primary document see N84-23809 14-32)
(AD-P002150) Avail: NTIS HC A07/MF A01 CSCL 22/2

U.S. military communications satellites can provide an impressive capability for command and control. Whether the combat forces will be able to make effective use of this capability depends on the operational management of the systems. Today, control of COMSAT systems optimizes their use to support a single mission or class of missions. In conflict it will be necessary to allocate capacity based on mission priority rather than peacetime operational concepts. A satellite control network tied to the JSC through the Space Defense Operations Center would allow rapid reallocation of capability to support wartime and crisis requirements without jeopardizing the role of the operational manager. Author

N84-23816# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Avionics Lab.
COMMAND POST MODEM/PROCESSOR (CPM/P)
James J. Foshee *In* AF Academy Proc. of the 1983 Symp. on Mil. Space Commun. and Operations 1983 p 53-56 refs (For primary document see N84-23809 14-32)
(AD-P002151) Avail: NTIS HC A07/MF A01 CSCL 17/2

The Command Post Modem/Processor (CPM/P) Advanced Development Program makes extensive use of micro-computer technology in the design of a subsystem of an Airborne Satellite Communications (SATCOM) system. This SATCOM system is being designed for eventual application on the Airborne Command Post fleet of aircraft to provide command of functions including message handling (routing), satellite command and control, satellite ranging and pointing computations, and complex signal processing while achieving a significant reduction in size, weight, power consumption, and volume as compared to present technologies. In addition, maintainability, reliability, life-cycle cost, and self-test are significant objectives in the development effort. The three principal units of the CPM/P are the Red Processor, The Black Processor, and the Modem, each housed in 1/2-ATR long CPM/P and the associated receiver/transmitters are controlled through the use of a plasma display, an interactive display which is designed to aid the operator in decision making and thus reduce demands on the operator during system operation. Author

N84-23817# Rockwell International Corp., Houston, Tex.
MISSION OPERATIONS IMPACT OF SPECIFIC SHUTTLE VEHICLE IMPROVEMENTS c16
Raymond A. Randolph *In* AF Academy Proc. of the 1983 Symp. on Mil. Space Commun. and Operations 1983 p 59-63 refs (For primary document see N84-23809 14-32)
(AD-P002152) Avail: NTIS HC A07/MF A01 CSCL 22/2

This paper highlights a study activity which assessed the impact of proposed Shuttle vehicle improvements on the tasks associated with Shuttle Mission Operations. These tasks were divided into the following Mission Operations phases: (1) flight planning phase; (2) flight readiness phase; (3) flight control phase. Vehicle improvements identified for assessment were: (1) autonomous navigation; (2) automated failure diagnosis; (3) increased crew size; (4) onboard consumable analysis; (5) software flight data file; and (6) advanced inflight maintenance. Task analyses of the Mission Operations phases provided the baseline criteria on which to make the impact assessment of the improvement candidates. Incorporation of vehicle improvements which contribute to autonomous Shuttle operations is one of the proposed solutions for reducing Mission Operation activities and staffing. Author

N84-23818# IBM Federal Systems Div., Houston, Texas.
A COMMONALITY APPROACH TO DoD COMMAND AND CONTROL CENTERS
Merritt E. Jones *In* AF Academy Proc. of the 1983 Symp. on Mil. Space Commun. and Operations 1983 p 67-71 (For primary document see N84-23809 14-32)
(AD-P002153) Avail: NTIS HC A07/MF A01 CSCL 17/2

For the past 25 years the Department of Defense (DoD) has become increasingly involved in the use of satellites for communications, navigation, surveillance and other missions. The support of these space missions required a growing number of ground systems which were developed essentially independent of each other. The advent of the Space Transportation System as a reusable launch vehicle and the upgrade of these centers. The potential commonality included software, hardware, procedures, training and operational concepts. Further investigation revealed excellent commonality in high level software and data processing systems. The advent of the Consolidated Space Operations Center which comprises seven segments and some co-located program elements provided even more impetus for a commonality approach to DoD command and control centers. The programs specifically addressed included the Shuttle Operations and Planning Complex, the Data System Modernization, the Global Positioning System and the Johnson Space Center (a National Aeronautics and Space Administration facility). The commonality results achieved to date and the ongoing investigation will be presented in the paper. Author

N84-23819# Air Force Space Div., Los Angeles, Calif. Program Office.
THE CONSOLIDATED SPACE OPERATIONS CENTER (CSOC) COMMUNICATIONS ACQUISITION
Michael E. Richards and Shiva Subramanya (TRW, Inc., Redondo Beach, Calif.) *In* AF Academy Proc. of the 1983 Symp. on Mil. Space Commun. and Operations 1983 p 73-82 refs (For primary document see N84-23809 14-32)
(AD-P002154) Avail: NTIS HC A07/MF A01 CSCL 17/2

The Consolidated Space Operations Center (CSOC) is being built in the Colorado Springs area to conduct DOD space operations. Its Satellite Operations complex and its Shuttle Operations and Planning Complex will be functionally similar, respectively, to the Air Force Satellite Test Center at Sunnyvale, California, and the NASA Johnson Space Center in Houston. CSOC Communications (CSOC-CS) will be common to both missions and will tie CSOC to Air Force and NASA nodes and networks. CSOC-CS faces a number of challenges: functional replication, multiple network interfaces, and evolution of other systems and philosophies. The problem is further compounded by an existing system that is still evolving and by a compressed schedule, as CS is the lead CSOC segment. Author

N84-23820# Department of the Air Force, Washington, D.C. International Law Div.
PEACEFUL USE AND SELF DEFENSE IN OUTER SPACE c12
A. J. Butler *In* AF Academy Proc. of the 1983 Symp. on Mil. Space Commun. and Opeations 1983 p 87-92 refs Previously announced in IAA as A84-17038 (For primary document see N84-23809 14-32)
(AD-P002155) Avail: NTIS HC A07/MF A01 CSCL 22/1

The concept of peaceful uses of outer space as defined by the actual practices of the U.S. and U.S.S.R. is examined. Specific prohibitions on the military use of outer space are reviewed and the legal effects of the subsequent practices of the parties in the interpretation of treaties, including the effects of subsequent hostilites, are discussed. Actual and projected uses of outer space for military purposes by the U.S. and U.S.S.R. are briefly reviewed. It is concluded that the inherent right of self-defense is directly applicable to outer space and that comprehensive military utilization of outer space is permissible under international law. C.D. (IAA)

N84-23821# Teledyne Brown Engineering, Huntsville, Ala.
SOVIET MILITARY CAPABILITIES IN SPACE c12
Nicholas L. Johnson *In* AF Academy Proc. of the 1983 Symp. on Mil. Space Commun. and Operations 1983 p 93-97 (For primary document see N84-23809 14-32)
(AD-P002156) Avail: NTIS HC A07/MF A01 CSCL 22/1

The Soviet Union now possesses an impressive array of dedicated and multi-purpose spacecraft aimed at enhancing her tactical and strategic military posture. The Soviety currently maintain over 80 active satellites to fulfill vital functions of communications, navigation, photographic reconnaissance, electronic intellience, early warning, meteorology, and speciaized ocean surveillance. In addition the Sovietys posses and operational anti-satellite system capable of negating low altitude (2000 kn) spacecraft. More importantly, the design and operational characteristics for these constellations include an integration of space assests into the Soviet defense infrastructure. A willingness to employ these assets to support global C3I objectives has also been observed. Author

N84-23822# Air Force Space Div., Los Angeles, Calif. Deputy for Defense Satellite Communications System.
DSCS 3: ACQUISITION AND TESTING Abstract Only
Gary Culp *In* AF Academy Proc. of the 1983 Symp. on Mil. Space Commun. and Operations 1983 p 101 (For primary document see N84-23809 14-32)
Avail: NTIS HC A07/MF A01 CSCL 17/2

The Defense Satellite Communications System Phase III (DSCS III) satellites provides key capabilities for the DSCS space sediment in the 1980's and 1990's. Acquisition strategy for these third generation DSCD spacecraft are outlined, beginning with competition for full-scale development and through the planned procurement of at least twelve follow-on production satellites. Special testing performed to help determine system survivability/nuclear hardness is reviewed. Planning and execution of launch operations and orbital testing of the first development satellite is discussed, including Initial Joint Operational Test and Evaluation. Operational development and user plans are also highlighted to include current satellite location and coverage. Author

N84-23823# TRW, Inc., Colorado Springs, Colo.
DISTRIBUTED DATABASE PERFORMANCE MODELING c60
M. Tsuchiya and M. P. Mariani *In* AF Academy Proc. of the 1983 Symp. on Mil. Space Commun. and Operations 1983 p 103-107 refs (For primary document see N84-23809 14-32)
(AD-P002157) Avail: NTIS HC A07/MF A01 CSCL 09/2

This paper describes a distributed database model that simulates database utilization in the SPADOC data processing environment. The model is table driven such that database access requirements, file locations, and other information necessary for defining the database environment are set up internally in several tables. Each operation for the SPADOC mission is defined and represented by a transaction flow diagram (TFD) and a sequence of TFDs representing a mission is input to the model. The model executes input TFDS by looking up tables that specify their data file access requirements. While executing TFDs, the history of database sage is logged and various statistics are gathered. The performance data are used to measure database access overhead, characterize database workload, and fine-tune performance by reallocating files. The model has been implemented in FORTRAN on the VAX 11/780 and has been used for both measuring a given database and analyzing sensitivity to design changes. It has proven to be an effective tool for measuring and analyzing design effectiveness of distributed databases. Author

N84-23824# National Defence Headquarters, Ottawa (Ontario).
OPTIMIZATION OF SATELLITE ORBITAL PARAMETERS FOR OCEANIC SURVEILLANCE c15
Eric Deslauriers *In* AF Academy Proc. of the 1983 Symp. on Mil. Space Commun. and Operations 1983 p 109-113 (For primary document see N84-23809 14-32)
(AD-P002158) Avail: NTIS HC A07/MF A01 CSCL 22/2

This paper examines the tradeoffs in orbital parameters and the geometric relationships involved in satellite surveillance of ocean areas. For illustrative purposes synthetic aperture radar (SAR) has been used as the sensor, hence some discussion of the sensor characteristics is included as well as orbital considerations, power requirements and data processing. Assuming that a target is detectable with SAR, this paper concludes that a single SAR satellite with optimum orbital parameters provides a high probability of detection of a target transiting in a given coverage area. Author

N84-23825# OAO Corp., Greenbelt, Md.
DYNAMIC SPACECRAFT SIMULATORS IN MILITARY SPACE GROUND SYSTEMS c14
Robert S. Smith, III, Phil David, and David A. Goodwin *In* AF Academy Proc. of the 1983 Symp. on Mil. Space Commun. and Operations 1983 p 119-126 (For primary document see N84-23809 14-32)
(AD-P002159) Avail: NTIS HC A07/MF A01 CSCL 14/2

Simulators have long been used in training situations to provide hands-on experience without risking expensive real systems. The most common example is in aircraft flight training. It has been OAO Corporation's experience that the same principles can be applied on a much more modest scale to expedite spacecraft ground system integration and operation training. The purpose of this paper is to outline some of the uses of simulators in the military space ground system environment, present some indicators which aid in determining when a simulator design. The authors validate these points by drawing on six years experience in providing space vehicles and operational simulation aids to NASA, USAF and commercial satellite control centers. Author

N84-23826# Royal Signals and Radar Establishment, Malvern (England).
REAL TIME SPEECH RECOGNITION ON A DISTRIBUTED DIGITAL PROCESSING ARRAY Memorandum Report
P. Simpson and J. B. G. Roberts Aug. 1983 24 p
(AD-A139097; RSRE-MEMO-3643; DRIC-BR-91086) Avail: NTIS HC A02/MF A01 CSCL 17/2

A compact digital signal processor based on the architecture of the ICL Distributed Array Processor (DAP) is under development for MOD applications in Radar, ESM, Image Processing, etc. This Memorandum examines its applicability to speech recognition. In such a distributed processor, optimum mapping of the problem on to the array of processors is vital for efficiency. Three mappings of a dynamic time warping algorithm for isolated word recognition are examined, leading to a feasbile real time capability for continuous speech processing. The compatibility found between dynamic programming methods and this class of machine enlarges the scope of signal processing algorithms foreseen as amenable to parallel processing. Author (GRA)

N84-23827# Naval Underwater Systems Center, New London, Conn.
EXTENSION OF FINITELY CONDUCTING EARTH-IMAGE-THEORY RESULTS TO ANY RANGE
P. R. Bannister 11 Jan. 1984 49 p
(X0792)
(AD-A139144; NUSC-TR-6885) Avail: NTIS HC A03/MF A01 CSCL 20/3

Finitely conducting earth-image-theory techniques have been employed to determine new formulas for the electric and magnetic fields produced by the four elementary dipole antennas for the air-to-air, surface-to-air, air-to-surface, and surface-to-surface propagation cases. The only restriction on the use of these formulas is that the index of refraction be large (i.e., the absolute value of n squared $>$ or $=$ 10). They are valid at any frequency and at any range for the flat-earth case. These formulas reduce to previously derived results, when either: (1) the measurement distance is much less than a free-space wavelength, (2) the Sommerfeld numerical distance is small, or (3) the measurement distance is much greater than an earth-skin depth. In terms of computer time, these new formulas can be evaluated in fractions of a minute compared with hours for the complete numerical evaluation of the exact Sommerfeld integrals. These formulas are

intended to supplement the author's recently derived subsurface-to-surface and air-to-air propagation formulas. Author (GRA)

N84-23828# Naval Postgraduate School, Monterey, Calif.
APPLICATION OF A DISTRIBUTED ROUTING ALGORITHM TO A PACKET-SWITCHED COMMUNICATIONS NETWORK M.S. Thesis
R. R. Logan Dec. 1983 336 p
(F21-245)
(AD-A139147; AD-E301345; NPS62-83-060) Avail: NTIS HC A15/MF A01 CSCL 17/2

Two distributed routing procedures based upon the Yen shortest path algorithm are developed for application in a packet-switched communications network. The algorithm uses a unique method in calculating shortest paths based upon the time of arrival of update messages. The first routing procedures uses a proposed 'combination' link weight function having parameters involving both current link queue size and recent history of link utilization. Performance of this procedure is analyzed under a variety of network conditions using computer simulation. A comparison study is done with both a least hop routing protocol and a multiple path static routing protocol. The second routing procedure has a hierarchical structure which offers substantial reductions in routing traffic and memory requirements over the first version when implemented in large networks. The major conclusion is that these routing procedures exhibit robust operating characteristics which are almost optimal in simple situations. Author (GRA)

N84-23829# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A PRACTICAL TERRESTRIAL PACKET RADIO NETWORK M.S. Thesis
S. W. Phillips, III Nov. 1983 164 p
(AD-A139162; AD-E500628; AFIT/CI/NR-83-83T) Avail: NTIS HC A08/MF A01 CSCL 17/2

A terrestrial packet radio network, now a competitive reality, offers a new alternative for local networks. Taking advantage of its adaptability to local environments and to the growing sources of digital communications, permits extension of data communications to remote locations. While adding capabilities for dispersed computer communications, there are limitations in using packet radio due to its bursty nature and less than absolute reliability. But as a message service for short duration communications, terrestrial packet radio may rapidly fill an important gap in communications. This thesis examines the features and design considerations for a practical terrestrial packet radio network. Packet radio equipment, evolving through stages of sophistication and new generation microcircuitry, is approaching the hand held model. While new digital features improve its mobility, the crucial consideration becomes the interconnection with other systems through adaptable protocols. This issue dominates the current research. GRA

N84-23830# Rome Air Development Center, Griffiss AFB, N.Y.
C3I MODELING AND SIMULATION
J. A. Mineo Sep. 1983 51 p
(AF Proj. 4506)
(AD-A139264; RADC-TR-83-223) Avail: NTIS HC A04/MF A01 CSCL 17/2

This report describes an RADC approach for the application of modeling and simulation tools to analyze and enhance the C3I process. The report is based on detailed examination of both the C3I process and available modeling assets in light of the RADC mission and AF requirements. Included in this report is an assessment of the simulation and modeling State-Of-The-Art and the Air Force needs. The Technical Issues which must be addressed and the impact on RADC programs are discussed. The classic digital simulation approach is also detailed in Appendix A. This discussion on technical issues is followed by a plan to link available RADC models, laboratories and common databases, using a local area network fiber optics/CATV communications distribution system to form a broadbased C3I system analysis capability. The report makes several recommendations toward realizing this C3I analysis capability including an investment strategy, followed by a summary. Author (GRA)

N84-23831# Air Force Geophysics Lab., Hanscom AFB, Mass.
DEVELOPMENT OF A COMMAND CONTROL AND COMMUNICATIONS SYSTEM FOR LIGHT AIRCRAFT Final Technical Report
A. R. Griffin 5 Oct. 1983 30 p
(AF Proj. 7659)
(AD-A139474; AFGL-TR-83-0275; AFGL-IP-319) Avail: NTIS HC A03/MF A01 CSCL 17/2

This report describes a state-of-the-art command control and communications system developed for use aboard a light aircraft during high altitude scientific research balloon flights. Author (GRA)

N84-23832# National Telecommunications and Information Administration, Boulder, Colo. Inst. for Telecommunication Sciences.
MILLIMETER WAVE ATTENUATION IN MOIST AIR: LABORATORY MEASUREMENTS AND ANALYSIS Final Report, 1 Aug. 1979 - 31 Dec. 1983
H. J. Liebe Mar. 1984 52 p
(Contracts MIPR-ARO-30-79; MIPR-ARO-42-80; MIPR-ARO-51-81; MIPR-ARO-6-82; MIPR-ARO-64-82; MIPR-ARO-101-83)
(AD-A139502; ARO-16638.23-GS) Avail: NTIS HC A04/MF A01 CSCL 04/1

Experiments were performed with a millimeter wave resonance-spectrometer capable of measuring absolute attenuation rates alpha (dB/km) by water vapor up to saturation pressures. Vapor (e) and air (p) pressures were varied at constant temperature and set frequency. Anomalous absorption behavior (i.e., high rates alpha, extreme temperature dependences, hystereses in pressure and temperature cycles) could be identified as being caused largely by instrumental condensation effects. Uncorrupted data at 138 GHz display, in addition to air-broadening, a strong self-broadening component. Based upon these results, a practical atmospheric millimeter wave propagation model was formulated that predicts attenuation, delay and noise properties of moist air over the frequency range of 1 to 1000 GHz and a height range of 0 to 100 km. The main spectroscopic data base consists of 48 O2 and 30 H2O local absorption lines complemented by continuum spectra for dry air and water vapor. Model input relies upon distributions of meteorological variables along an anticipated radio path. These variables are pressure, temperature, and relative humidity for moist air; suspended droplet concentration for haze, fog, cloud conditions; and a rain rate. In special cases, trace gas concentrations for ozone and carbon monoxide and the geomagnetic field strength can be added. GRA

N84-23833# Polytechnic Inst. of New York, Brooklyn.
LUMPED ELEMENT AND LEAKY-WAVE ANTENNAS FOR MILLIMETER WAVES Interim Report
A. A. Oliner Hanscom AFB, Mass. RADC Jan. 1984 27 p
(Contract F19628-81-K-0044; AF Proj. 2305)
(AD-A139512; RADC-TR-83-294) Avail: NTIS HC A03/MF A01 CSCL 09/5

This abstract is concerned with certain types of antennas for millimeter waves that cannot be successfully scaled from their microwave frequency counterparts. Among these antennas, we chose first to explore novel antennas of the leaky-wave type, largely because they form a natural class of antennas for millimeter waves. Leaky-wave antennas for the millimeter wave range face two main problems. The first relates to the small wavelengths involved, which require small waveguide dimensions and pose fabrication difficulties. The second problem is higher metal loss. We are overcoming the first of these problems by considering leaky-wave structures with longitudinally-continuous apertures, and the second by basing the antennas on low-loss waveguides. With these essential features in mind, our program involves two parallel approaches to the same basic problem: novel leaky-wave antennas suitable for millimeter wavelengths. The parallel approaches employ, first of all, two different basic low-loss waveguides, and

second, two different mechanisms to produce leakage. As a result, two new antenna types have emerged. GRA

N84-23834# Royal Australian Navy Research Lab., Edgecliff.
A MODEL OF RADAR PROPAGATION AND DETECTION
M. R. Battaglia and P. Williams Dec. 1983 97 p
(AD-A139531; RANRL-TN-2/83) Avail: NTIS HC A05/MF A01 CSCL 17/9

A computer model of radar propagation and detection is described. The details of multipath, clutter, attenuation, and probability of detection algorithms are contained in separate annexes. Author (GRA)

N84-23835# Institut fuer Digitale Bildverarbeitung und Graphik, Graz (Austria).
EVALUATION OF RADARGRAMMETRIC STEREO Final Report, 1 Jul. 1982 - 30 Jun. 1983
G. Domik, F. Leberl, and J. Raggam 11 Oct. 1983 131 p
(Contract F49620-82-C-0053)
(AD-A139565) Avail: NTIS HC A07/MF A01 CSCL 17/9

The ability of an observer to stereoscopically view overlapping radar image pairs is evaluated. This analysis is based on a set of aircraft and satellite radar data, and on data generated by means of computer simulation. Synthesis of radar images is based on digital elevation models, allowing one to study a much wider range of flight parameters and sensor geometries than is currently available for study with real data. The report discusses simulation techniques, presents an evaluation of different radar-grammetric stereo geometries and analyses effects of squint angle, look angles and look angle differences on the stereoscopic view-ability of overlapping radar images. Author (GRA)

N84-23836# Naval Research Lab., Washington, D. C.
RANGE-DOPPLER MOVING TARGET INDICATOR (MTI) ANALYSIS AND ASSESSMENT Interim Report
F. F. Kretschmer, Jr., B. L. Lewis, and F. L. C. Lin 20 Mar. 1984 22 p
(F12131)
(AD-A139579; NRL-8789) Avail: NTIS HC A02/MF A01 CSCL 17/9

The concept of a new moving target indicator (MTI) based on the range-Doppler coupling properties of chirp, step-chirp, and certain polyphase codes is discussed. The principal feature of the range-Doppler coupled MTI is that target blind speeds are eliminated. The polyphase codes must by symmetric for proper operation in a range-Doppler coupled MTI. The performance of this MTI is evaluated, and its limitations are identified.
Author (GRA)

N84-23837# Lincoln Lab., Mass. Inst. of Tech., Lexington. ER104884
VOCODER ANALYSIS BASED ON PROPERTIES OF THE HUMAN AUDITORY SYSTEM
B. Gold and J. Tierney 22 Dec. 1983 93 p
(Contract F19628-80-C-0002; AF Proj. 7820)
(AD-A138660; TR-670; ESD-TR-83-226) Avail: NTIS HC A05/MF A01 CSCL 05/10

When a person listens to speech corrupted by noise or other adverse environmental factors, speech intelligibility may be impaired slightly or not at all. The same corrupted speech, after being vocoded, often causes drastic intelligibility loss. The loss is due to the fact that the human peripheral auditory system is a superior signal processor to that of the vocoder. This report is based on the premise that a vocoder analyzer that better resembles the peripheral auditory system would function in a superior manner to present-day vocoders. Topics include reviews of speech enhancement techniques, perceptual analysis of diagnostic rhyme test data, a brief description of the peripheral auditory system and an outline of proposed psychophysical tests. The final section is devoted to a discussion of some preliminary work on computer simulation of an auditory model. GRA

N84-23838# Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
SYNTHETIC VOICE: POWER SYSTEM ENUNCIATION SPEECH SYNTHESIS SYSTEM Interim Report
D. A. Skiles, S. C. Stitt, G. Brown, and E. Campbell Oct. 1983 49 p refs
(PB84-151646; REC-ERC-83-7) Avail: NTIS HC A03/MF A01 CSCL 17B

Hardware and software to synthesize human voice utilizing a digital computer are described. Digital signal processing and delta modulation analog signal conversion methods necessary to synthesize voice signals are included. An analysis was made on several synthetic voice technologies; one was tested and results are presented. GRA

N84-23839# National Telecommunications and Information Administration, Boulder, Colo. Inst. for Telecommunication Sciences.
PRIMER ON INTEGRATED SERVICES DIGITAL NETWORKS (ISDN): IMPLICATIONS FOR FUTURE GLOBAL COMMUNICATIONS
Sep. 1983 91 p refs
(PB84-152586; NTIA-R-83-138) Avail: NTIS HC A05/MF A01 CSCL 17B

A primer on Integrated Services Digital Networks (ISDN's) is given. The ISDN concept is believed by many to be the communication means for the future information age. A number of national ISDN's interconnected together can provide a high-performance, multiservice, digital network for global communications. This primer on ISDN is for persons unfamiliar with telecommunications but who wish to know about this important concept. The developments in telecommunications technology-from analog to digital-that make possible the efficiencies and economies of an ISDN or ISDN's are discussed. Also addressed are technical and policy considerations: Why is an ISDN needed? How is it expected to evolve? What problems will it cause? Who is working on them?
Author (GRA)

N84-24151# Toronto Univ. (Ontario). Dept. of Electrical Engineering.
TERNARY TRANSMISSION TO LOCAL AREA NETWORKS
S. G. Zaky and Z. G. Vranesic *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 242-248 refs
(For primary document see N84-24115 14-59)
(AD-P002360) Avail: NTIS HC A19/MF A01 CSCL 17/2

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N84-23840# Sandia Labs., Albuquerque, N. Mex.
TESTING OF SEALED LEAD-ACID BATTERIES
D. M. Bush, J. D. Sealey, and D. W. Miller Feb. 1984 18 p refs
(Contract DE-AC04-76DP-00789)
(DE84-008209; SAND-83-2334) Avail: NTIS HC A02/MF A01

Sealed lead acid batteries under development were tested. The goal was to develop a totally maintenance free sealed lead acid battery capable of deep discharge operation in a photovoltaic power system. Sealed lead acid batteries and a group of conventional, flooded lead acid batteries were exposed to a matrix test plan, with some approaching 1000 cycles. This performance was achieved with the standard National Electrical Manufacturers' Association cycle test, and the partial state of charge cycle test. Modes of failure are investigated. DOE

N84-23841*# Analex Corp., Cleveland, Ohio.
USERS' MANUAL FOR COMPUTER PROGRAM FOR THREE-DIMENSIONAL ANALYSIS OF COUPLER-CAVITY TRAVELING WAVE TUBES Final Report
Thomas A. OMalley Jan. 1984 66 p refs
(Contract NAS3-23293)
(NASA-CR-168269; E-1930; NAS 1.26:168269) Avail: NTIS HC A04/MF A01 CSCL 09A

The use of the coupled cavity traveling wave tube for space communications has led to an increased interest in improving the efficiency of the basic interaction process in these devices through velocity resynchronization and other methods. A flexible, three dimensional, axially symmetric, large signal computer program was developed for use on the IBM 370 time sharing system. A users' manual for this program is included. M.A.C.

N84-23842# Naval Research Lab., Washington, D. C.
A CIRCUIT DESIGN FOR MULTIPLEXED DIGITAL CORRELATION AT 60 MHz
J. H. Layno and L. M. Leibowitz 6 Mar. 1984 20 p
(W12-53)
(AD-A139117; NRL-MR-5276) Avail: NTIS HC A02/MF A01 CSCL 17/2

Method have recently been developed to improve the speed of digital correlators by application of time division multiplexing techniques. Using one such method, a correlator circuit may be constructed in which several multiplexed correlators are parallel loaded with data in a sequential manner and an overall correlation output is determine by properly sampling the outputs of each mulitplexed correlator. The design of a single 64 x 4 bit mulitplexed correlator is presented. Data selection circuitry to form the correct correlation from several such correlators is described. Design considerations arising from the correlator's desired operational rate of 60 MHz are discussed. Author (GRA)

N84-23843# Texas Technological Univ., Lubbock. Dept. of Electrical Engineering.
COORDINATED RESEARCH PROGRAM IN PULSED POWER PHYSICS Final Report, 1 Jul. 1979 - 31 Dec. 1983
M. Kristiansen, M. Hagler, J. Craig, L. Hatfield, and G. Schaefer 27 Feb. 1984 392 p
(Contracts F49620-79-C-0191; MIPR-16-81; AF Proj. 2301)
(AD-A139321; AFOSR-84-0174TR; ARO-17829.11-PH) Avail: NTIS HC A17/MF A01 CSCL 10/2

The work on eight program elements related to pulsed power research over the past four years is summarized. These program elements form a multi-disciplinary, coordinated program whose main emphasis is to gain improved understanding of high power, repetitive closing and opening switches. The main emphasis is concerned with triggering of discharges in gas filled spark gaps and the associated electrode erosion and insulator damage. Considerable efforts are also being made to understand the limitations and fundamental discharge phenomena in fast opening switches for inductive energy storage. A novel electromechanical pulse generator which promises to deliver fast, repetitive pulses has also been investigated. The major, overall, accomplishments in each program element are summarized and last year's work is described in some detail. Author (GRA)

N84-23844# Harry Diamond Labs., Adelphi, Md.
TLINES: A COMPUTER PROGRAM FOR CIRCUITS OF TRANSMISSION LINES
G. A. Huttlin and A. J. Lelis Dec. 1983 60 p
(DA Proj. 1L1-61101-A-91A)
(AD-A139596; HDL-TM-83-22) Avail: NTIS HC A04/MF A01 CSCL 09/5

TLINES, a FORTRAN program installed on the PDP-11/60 computer at the Harry Diamond Laboratories Aurora Facility, is specifically designed for transmission-line circuit calculations on a small computer. Detailed step-function waves originate as exact originate as exact solutions of a chosen initial charge distribution. Lumped inductances and capacitances are modelled as transmission-line segments. Data are input interactively, and the output consists primarily of plots on a graphics terminal of current, voltage, power, and energy as functions of time at various positions in the circuit and plots of current, and power as functions of position at given times. The program has provisions for: (1) closing and opening switches, (2) series and parallel resistances between transmission lines, and (3) series and parallel connections of transmission lines. Discussed are the basic theory relevant to the program, the construction of the program, instructions for the use of the program, and examples of its use. Author (GRA)

N84-23845# Sandia Labs., Albuquerque, N. Mex.
SOME DIFFICULTIES DEVELOPING A LARGE-SCALE RESEARCH GRADE CAD PROGRAM FOR A PRODUCTION ENVIRONMENT
J. A. Wisniewski Apr. 1984 2 p refs Presented at 12th Ann. Mountain Regional Conf., Phoenix, Ariz., 27 Apr. 1984
(DE84-005549; SAND-84-0026C; CONF-840490-1) Avail: NTIS HC A02/MF A01

The conflicts between research associated with the development of new algorithms and the creation of a production grade IC Layout code introduces some unique challenges in software engineering. A production environment addresses well defined problems which have well established algorithms and associated data structures. A research environment also addresses relatively well defined problems, but the algorithms and data structures required to solve the problem are developed afresh and evolve with time. Performing research when a production grade code is the intended end result requires flexible and extensible data structures, complete modularity of the code, and careful planning (sequencing) of the development effort. Code rewrites have been experienced on the project when the coding of an algorithm was begun before all of the research and modeling questions associated with a problem had been answered. For this reason it is felt that there should be a significant time lag between the onset of the research effort and the beginning of the coding/development effort. The code currently exceeds 40,000 lines of PASCAL and will exceed 60,000 lines before the project is complete. The software is designed to be user-friendly relying heavily on interactive graphics and utilizing a hierarchical HELP facility. DOE

N84-23846# Los Alamos Scientific Lab., N. Mex.
AN ELECTRODYNAMIC INTERPRETATION OF VIRTUAL-CATHODE OSCILLATIONS
Abraham Kadish Jan. 1984 13 p refs
(Contract W-7405-eng-36)
(DE84-008001; LA-9908) Avail: NTIS HC A02/MF A01

Virtual cathode oscillations and particle bunching which were proven to be electrodynamic shock induced phenomena when magnetic field and thermal effects are small compared to those due to plasma energy and electric fields are discussed. The complete solution of one dimensional problems is reduced to quadratures. DOE

N84-23847# Brookhaven National Lab., Upton, N. Y. Accelerator Dept.
SUPERCONDUCTING POWER TRANSMISSION SYSTEM DEVELOPMENT. CABLE INSULATION DEVELOPMENT Semiannual Report, 1 Oct. 1982 - 31 Mar. 1983
14 Sep. 1983 65 p
(Contract DE-AC02-76CH-00016)
(DE84-007805; BNL-51719) Avail: NTIS HC A04/MF A01

The development of an underground superconducting power transmission system which is economical and technically attractive to the utility industry is discussed. Suitable superconductors and dielectric insulation were developed. Cables several hundred feet long are tested under realistic conditions. Three operating runs of about 2 weeks duration each were accomplished. The 60 Hz steady state performance of the cables under rated conditions was explored. Over voltage endurance tests and emergency level current tests were performed. DOE

N84-23848# California Univ., Livermore. Lawrence Livermore Lab.

ALUMINUM-AIR RESEARCH AND DEVELOPMENT PROGRAM. SUMMARY REPORT FOR FY 1982
J. F. Cooper Apr. 1983 18 p refs
(Contract W-7405-eng-48)
(DE84-008360; UCID-20023) Avail: NTIS HC A02/MF A01

The aluminum-air program focused on the following research areas: (1) experimental investigation of alternative cell configurations; (2) testing of specific configurations in multicell stacks; (3) long term testing of air electrodes under simulated vehicle duty cycles; (4) determination of kinetic of aluminum trihydroxide crystallization under candidate battery operating conditions; and (5) studies of anode behavior of alloys containing minor impurities such as iron, manganese, gallium, and phosphorus. The major achievements were: the operation of six celled and two cell stacks without degration of performance compared to laboratory baseline cells, redesign of solution side current collection grid and successful application to wedge shaped cells on the engineering scale (600 cm(2)); demonstration of ability of such cells for continuous anode feed and rapid refueling, fabrication and testing of air electrodes catalyzed with certain macrocyclic complexes; extension of cycle life to above 1000 standard drive cycles using nonnoble metal catalysts, determination of role of minor electrolye additions and precipitated Al(OH)3 on air electrode life, development of a comprehensive mathematical model of aluminum trihydroxide precipitation under battery conditions. DOE

N84-23849# Drexel Univ., Philadelphia, Pa. Dept. of Electrical and Computer Engineering.
SOLAR CELL CHARACTERIZATION BY PHOTOCAPACITANCE Final Report, 1 Jul. 1980 - 31 Aug. 1983
Allen Rothwarf Dec. 1983 152 p refs
(Grant DE-FG02-80CS-83105)
(DE84-008215; DOE/CS-83105-2) Avail: NTIS HC A08/MF A01

New solor cells were studied by electrooptical characterization and modeling. The principal cells studied were a-Si:H and CuInSe2/CdS with some work on Cu2S/CdS and Zn3P2/Mg. Abilities to characterize solar cells by photocapacitance and current voltage techniques as a function of voltage, illumination level and wavelength, temperature (77 (0K to 400(0)K), frequency, and pulses of light and voltage, were developed. DOE

N84-23850# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Information und Dokumentation.
ELECTRONICS IN WEAPON SYSTEMS [ELEKTRONIK IN WAFFENSYSTEMEN]
W. Hagenbucher 22 Feb. 1983 9 p In GERMAN Presented at VDI-Veranstaltung, Augsburg, West Ger., 22 Feb. 1983
(MBB-UA-768-83-O) Avail: NTIS HC A02/MF A01

The use of electronics in weapon systems is described. The electronics policy of the US Ministry of Defense is explained. The computer generated images and digital radar landmass simulation system for cost efficient training is presented. Flight simulation systems are compared. Military computers used as flight aids are presented. A digital photogrammetry system is described. Air control information systems are described. Author (ESA)

N84-23804# Joint Publications Research Service, Arlington, Va.
NEW INTEGRATED CIRCUIT TECHNOLOGY Abstract Only
In its East Europe Rept.: Sci. Affairs (JPRS-ESA-84-0090 21 Mar. 1984 p 18-19 Transl. into ENGLISH from Polish Eng. (Warsaw), no. 3, Mar. 1983 p 7 (For primary document see N84-23802 14-31)
Avail: NTIS HC A03/MF A01

N84-24116# Montreal Univ. (Quebec). Centre de Recherches Mathematiques.
COMPLETENESS FOR UNIFORMLY DELAYED CIRCUITS
I. G. Rosenberg and T. Hikita (Tokyo Metropolitan Univ.) *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 2-10 refs (For primary document see N84-24115 14-59)
(AD-P002325) Avail: NTIS HC A19/MF A01 CSCL 12/1

N84-24119# Oklahoma Univ., Norman. School of Electrical Engineering and Computer Science.
A STRUCTURED DESIGN OF MULTIPLE-VALUED LSI/VLSI WITH BUILT-IN TESTING CAPABILITY
Samuel C. Lee and Krayim Santrakul *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 27-34 refs (For primary document see N84-24115 14-59)
(AD-P002328) Avail: NTIS HC A19/MF A01 CSCL 09/5

N84-24123# Shanghai Inst. of Railway Technology (China). Dept. of Telecommunication.
THE NEW METHOD OF IMPLEMENTATION FOR TERNARY LOGIC SYSTEM
Li Meng and Gu Wei-Nan *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 56-60 refs (For primary document see N84-24115 14-59)
(AD-P002332) Avail: NTIS HC A19/MF A01 CSCL 09/5

N84-24124# Oita Univ. (Japan). Faculty of Engineering.
MICROPOWER CMOS IMPLEMENTATION OF THREE-VALUED LOGIC FUNCTIONS
Seiichi Muta *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 61-63 refs (For primary document see N84-24115 14-59)
(AD-P002333) Avail: NTIS HC A19/MF A01 CSCL 09/5

N84-24125# Shanghai Inst. of Railway Technology (China).
LOW POWER 2-OF-3-VALUED CMOS SELF-CHECKING CIRCUITS
Hu Mou, K. C. Smith (Toronto Univ.), and H. T. Mouftah (Queen's Univ., Kingston, Ontario) *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 64-69 refs (For primary document see N84-24115 14-59)
(AD-P002334) Avail: NTIS HC A19/MF A01 CSCL 09/5

N84-24129# Northwestern Univ., Evanston, Ill. Dept. of Electrical Engineering and Computer Science.
ON THE NUMBER OF LOCATIONS REQUIRED IN THE CONTENT-ADDRESSABLE MEMORY IMPLEMENTATION OF MULTIPLE-VARIED FUNCTIONS
Jon T. Butler *In its* The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 94-102 refs (For primary document see N84-24115 14-59)
(AD-P002338) Avail: NTIS HC A19/MF A01 CSCL 09/5

N84-24135# International Business Machines Corp., Poughkeepsie, N.Y.
THE IMPLEMENTATION AND USE OF MULTIVALUED LOGIC IN A VLSI ENVIRONMENT
H. Fleischer *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 135-143 refs (For primary document see N84-24115 14-59)
(AD-P002344) Avail: NTIS HC A19/MF A01 CSCL 09/5

N84-24136# Hachinohe Inst. of Tech. (Japan). Dept. of Electrical Engineering.
PULSE-TRAIN RESIDUE ARITHMETIC CIRCUIT USING MULTIPLE-VALUED CHARGE-COUPLED DEVICES AND ITS APPLICATION TO DIGITAL FILTER
In Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 146-151 refs (For primary document see N84-24115 14-59)
(AD-P002345) Avail: NTIS HC A19/MF A01 CSCL 09/5

N84-24137# Technische Hogeschool Twente, Enschede (Netherlands). Dept. of Electrical Engineering.
TOLERANCE ANALYSIS AND RELATED MEASUREMENTS ON MVL-CCD'S (MULTIPLE-VALUED-CHARGE-COUPLED DEVICES) Final Report
H. G. Kerhoff, J. deGroot, and A. C. Brombacher *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 152-161 refs (For primary document see N84-24115 14-59)
(AD-P002346) Avail: NTIS HC A19/MF A01 CSCL 09/5

N84-24138# Northwestern Univ., Evanston, Ill. Dept. of Electrical Engineering and Computer Science.
TABULAR METHODS FOR THE DESIGN OF CCD (CHARGE-COUPLED DEVICES) MULTIPLE-VALUED CIRCUITS
J. K. Lee and J. T. Butler *In its* The 13th Intern Symp. on Multiple-Valued Logic 1983 p 162-170 refs (For primary document see N84-24115 14-59)
(AD-P002347) Avail: NTIS HC A19/MF A01 CSCL 09/5

N84-24140# Wanzhong Machinery Plant, Sichuan (China).
VECTOR EXPANSION TRANSFORMATION OF LOGIC ALGEBRA
L. Zhimo and Y. Yougnang (Wuhan Digital Engineering Inst., Hubei, China) *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 177-182 refs (For primary document see N84-24115 14-59)
(AD-P002349) Avail: NTIS HC A19/MF A01 CSCL 09/5

N84-24141# Quebec Univ., Trois-Riveres. Dept. of Mathematics.
ROOTS OF N-VALUED SWITCHING FUNCTIONS
Corina Reischler and Dan A. Simevici (Massachusetts Univ., Amherst) *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 183-188 refs Sponsored by Natural Sciences and Engineering Research Council of Canada (For primary document see N84-24115 14-59)
(AD-P002350) Avail: NTIS HC A19/MF A01 CSCL 09/5

N84-24142# California Univ., Davis. Integrated Circuits Lab.
A QUATERNARY LOGIC ENCODER-DECODER CIRCUIT DESIGN USING CMOS
D. A. Freitas and K. W. Current *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 190-195 refs Sponsored in part by Data General Corporation (For primary document see N84-24115 14-59)
(AD-P002351) Avail: NTIS HC A19/MF A01 CSCL 09/5

N84-24143# Yatsushiro Technical Coll., Kumamoto (Japan). Dept. of Information and Electronic Engineering.
REALIZATION AND ANALYSIS OF A MASK-PROGRAMMABLE I2L MULTIVALUED LOGIC CIRCUIT
K. Taniguchi, T. Inoue, and F. Ueno *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 196-200 refs (For primary document see N84-24115 14-59)
(AD-P002352) Avail: NTIS HC A19/MF A01 CSCL 09/5

N84-24144# Nihon Univ., Funabashi (Japan). Dept. of Electronic Engineering.
LOGIC-TYPE SCHMITT CIRCUIT USING MULTI-VALUED GATES Final Report
M. Wakui and M. Tanaka *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 201-206 refs (For primary document see N84-24115 14-59)
(AD-P002353) Avail: NTIS HC A19/MF A01 CSCL 09/5

N84-24150# Tohoku Univ., Sendai (Japan). Dept. of Electronic Engineering.
IMAGE PROCESSING ALGORITHMS FOR A MULTIPLE-VALUED ARRAY PROCESSOR
M. Kameyama, K. Suzuki, and T. Higuchi *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 236-241 refs (For primary document see N84-24115 14-59)
(AD-P002359) Avail: NTIS HC A19/MF A01 CSCL 09/5

N84-24159# Chiba Univ. (Japan). Dept. of Electronic Engineering.
A UNIFIED APPROACH TO COMPOSITE MVL WITH MONOTONIC SUBFUNCTION
Maturoh Nakamichi and Hideo Itoh *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 300-305 refs (For primary document see N84-24115 14-59)
(AD-P002368) Avail: NTIS HC A19/MF A01 CSCL 09/4

N84-24168# Illinois Inst. of Tech., Chicago.
AUTOMATED DESIGN OF COMBINATIONAL NETWORKS UNDER SPECIFIC CONSTRAINTS: A THEOREM PROVING APPROACH
Waldo C. Kabat *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 366-396 refs Sponsored in part by NSF (For primary document see N84-24115 14-59)
(Contract W-31-109-eng-38)
(AD-P002377) Avail: NTIS HC A19/MF A01 CSCL 09/5

N84-24169# Bell Telephone Labs., Inc., Naperville, Ill.
SYNTHESIS OF MULTIPLE-VALUED LOGIC FUNCTIONS BASED ON A MODULAR DESIGN APPROACH
Kwang-Ya Fang and Anthony S. Wojcik (Illinois Inst. of Technology, Chicago) *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 397-407 refs (For primary document see N84-24115 14-59)
(Grant NSF MCS-79-01689)
(AD-P002378) Avail: NTIS HC A19/MF A01 CSCL 09/5

N84-24170# West Virginia Univ., Morgantown. Dept. of Electrical Engineering.
SYNTHESIS ALGORITHM FOR MINIMAL COMPONENTS IN T-ULM NETWORKS
Powsiri Klinkhachorn and Robert Swartwout *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 408-413 refs (For primary document see N84-24115 14-59)
(AD-P002379) Avail: NTIS HC A19/MF A01 CSCL 09/5

N84-24172# Hangzhou Univ. (China). Dept. of Physics.
THE SYNTHESIS OF TERNARY FUNCTIONS UNDER FIXED POLARITIES AND TERNARY I-2L CIRCUITS
X. Chen and X. Wu *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 424-429 refs (For primary document see N84-24115 14-59)
(AD-P002381) Avail: NTIS HC A19/MF A01 CSCL 09/5

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N84-23851# Aeronautical Research Labs., Melbourne (Australia).
ON SEPARATING TURBULENT BOUNDARY LAYERS
W. H. Schofield Sep. 1983 56 p refs
(ARL-Mech-Eng-Rept-162; AR-002-978) Avail: NTIS HC A04/MF A01

Two dimensional turbulent boundary layer separation are discussed. It is shown that the Schofield and Perry defect law can describe detached profiles as accurately as it can describe attached profiles if the origin is shifted, from the wall, out to the zero velocity position in the detached flow. For attached flow the inner wall matching condition is the usual law of the wall. For detached flow the wall matching condition is provided by the reversed flow for which a modified similarity scale is proposed. This extended validity of the Schofield and Perry defect law implies a unique progression of mean velocity profile shapes up to and through separation. It is suggested that detachment (and perhaps reattachment) always occurs at the same position on the locus of profile shapes, in which boundary layers detach with a universal mean profile shape. It is concluded that layers with separate in moving equilibrium detach with the same mean profile shape, and detach at the same local pressure gradient. E.A.K.

N84-23852*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
FINITE-DIFFERENCE FLUID DYNAMICS COMPUTER MATHEMATICAL MODELS FOR THE DESIGN AND INTERPRETATION OF EXPERIMENTS FOR SPACE FLIGHT
Glyn O. Roberts (Roberts Associates, Inc.), William W. Fowlis,

and Timothy L. Miller May 1984 16 p refs
(NASA-TP-2323; NAS 1.60:2323) Avail: NTIS HC A02/MF A01 CSCL 05H

Numerical methods are used to design a spherical baroclinic flow model experiment of the large scale atmosphere flow for Spacelab. The dielectric simulation of radial gravity is only dominant in a low gravity environment. Computer codes are developed to study the processes at work in crystal growing systems which are also candidates for space flight. Crystalline materials rarely achieve their potential properties because of imperfections and component concentration variations. Thermosolutal convection in the liquid melt can be the cause of these imperfections. Such convection is suppressed in a low gravity environment. Two and three dimensional finite difference codes are being used for this work. Nonuniform meshes and implicit iterative methods are used. The iterative method for steady solutions is based on time stepping but has the options of different time steps for velocity and temperature and of a time step varying smoothly with position according to specified powers of the mesh spacings. This allows for more rapid convergence. The code being developed for the crystal growth studies allows for growth of the crystal as the solid-liquid interface. The moving interface is followed using finite differences; shape variations are permitted. For convenience in applying finite differences in the solid and liquid, a time dependent coordinate transformation is used to make this interface a coordinate surface. A.R.H.

N84-23853# Toronto Univ. (Ontario). Inst. of Aerospace Studies.
FORMATION OF A SHOCK WAVE IN A DUSTY GAS BY A MOVING PISTON
H. Miura and I. I. Glass Mar. 1984 66 p refs Sponsored in part by Natural Science and Engineering Research Council of Canada
(Contract DNA001-83-C-0266; Grant AF-AFOSR-0096-82)
(UTIAS-275; ISSN-0082-5255) Avail: NTIS HC A04/MF A01

The nonstationary flow induced by a piston moving impulsively at a constant speed in a dusty gas is studied analytically. The effect of suspended particles on a fully developed shock wave is discussed on the basis of an idealized equilibrium-gas approximation. The equations of motion are also solved numerically by means of a modified random-choice method and an operator-splitting technique for the cases when the final shock structure is partially or fully dispersed. The numerical results show the detailed behaviour of the flow in a transitional nonequilibrium state. The case when the particles that collide with the surface of the piston reflect elastically is investigated together with the case when they stick to it. When the particles are reflected from the piston at high speed, they move faster than the shock front for a while. The shock front in this case propagates initially at a larger velocity than in the pure gas case. Author

N84-23854*# Michigan Univ., Ann Arbor. Heat Transfer Lab.
MODELING OF ZERO GRAVITY VENTING Interim Report
Herman Merte, Jr. May 1984 42 p refs
(Grant NAS3-403)
(NASA-CR-173503; NAS 1.26:173503; Rept-020547-IR-1) Avail: NTIS HC A03/MF A01 CSCL 20D

The venting of cylindrical containers partially filled with initially saturated liquids was conducted under zero gravity conditions and compared with an analytical model which determined the effect of interfacial mass transfer on the ullage pressure response during venting. A model is proposed to improve the estimation of the interfacial mass transfer. Duhammel's superposition integral is incorporated in this analysis to approximate the transient temperature response of the interface, treating the liquid as a semiinfinite solid with conduction heat transfer. This approach to estimating interfacial mass transfer gives improved response when compared to previous models. The model still predicts a pressure decrease greater than those in the experiments reported. M.A.C.

N84-23855# Arizona Univ., Tucson. Dept. of Mathematics.
THE STABILITY OF INVISCID VORTEX STREETS OF FINITE CORED VORTICES Technical Summary Report
D. I. Meiron, P. G. Saffman (California Inst. of Technology, Pasadena), and J. C. Schatzman (Chevron Oil Field Research) Jan. 1984 58 p
(Contract DAAG29-80-C-0041)
(AD-A139311; MRC-TSR-2634) Avail: NTIS HC A04/MF A01 CSCL 20/4

The stability of two-dimensional infinitesimal disturbances of the inviscid Karman vortex street of finite area vortices is reexamined. Numerical results are obtained for the growth rate and oscillation frequencies of disturbances of arbitrary subharmonic wavenumber and the stability boundaries are calculated. The stabilization of the pairing instability by finite area demonstrated by Staffman and Schatzman (1982) is confirmed and also Kida's (1982) result that this is not the most unstable disturbance when the area is finite. Contrary, however, to Kida's quantitative predictions, it is now found that finite area does not stabilize the street to infinitesimal two-dimensional disturbances of arbitrary wavelength and that it is always unstable except for one isolated value of the aspect ratio which depends upon the size of the vortices. Author (GRA)

N84-23856# Pennsylvania State Univ., University Park. Applied Research Lab.
A RAPID METHOD FOR PREDICTING SUCTION DISTRIBUTIONS TO MAINTAIN ATTACHED, LAMINAR BOUNDARY LAYERS ON BODIES OF REVOLUTION
G. H. Hoffman 9 Dec. 1983 77 p
(Contract N00024-79-C-6043)
(AD-A139125; ARL/PSU/TM-83-201) Avail: NTIS HC A05/MF A01 CSCL 20/4

An approximate method is presented for the determination of the minimum amount of suction necessary to maintain a laminar, attached boundary layer in incompressible, axisymmetric flow. The method is an extension of A.M.O Smith's procedure which calculates a general laminar boundary layer by piecewise similarity solutions. An extension has been programmed on a VAX 11/782 computer and found to the extremely fast, taking from 3 to 4 secs. in CPU time. Boundary-layer solutions for four axisymmetric bodies at a variety of Reynolds numbers have been obtained and the results are compared with finite difference solutions which use the suction distribution from the approximate theory. Agreement between the two is generally good. GRA

N84-23857# Army Armament Research and Development Command, Dover, N. J. Large Caliber Weapon Systems Lab.
SHOCK FRONT PUMPED STOKES AND ANTI-STOKES REFLECTIVITY CONTRIBUTIONS
P. Harris and H. N. Presles Mar. 1984 25 p
(DA Proj. 1L1-61102-AH-60)
(AD-A139134; AD-E401140; ARLCD-TR-84002) Avail: NTIS HC A02/MF A01 CSCL 20/4

It is claimed that mass density shock pumped excited states can be converted to Stokes and Anti-Stokes radiation which would contribute to shock front optical reflectivity signals in liquid water at 5.9 kbar. The experimental status and relevant theory are described in detail. GRA

N84-23858# Wisconsin Univ., Madison. Mathematics Research Center.
BUBBLES RISING IN A TUBE AND JETS FALLING FROM A NOZZLE Technical Summary Report
J. M. VandenBroeck Jan. 1984 21 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-80-01960)
(AD-A139266; MRC-TSR-2631) Avail: NTIS HC A02/MF A01 CSCL 12/1

The shape of a two-dimensional bubble rising at a constant velocity U in a tube of width h is computed. The flow is assumed to be inviscid and incompressible. The problem is solved numerically by collocation. The results confirm Garabedin's findings. There exists a unique solution for each value of the Froude number $F=U/(gh)^{1/2}$ smaller than a critical value I_c. Here g denotes the acceleration of gravity. It is found that $I_c = 0.36$. In

addition the problem of a jet emerging from a vertical nozzle is considered. It is shown that the slope of the free surface at the separation points is horizontal for F F sub c and vertical for F F sub c. Graphs and tables of the results are included.

Author (GRA)

N84-23859# Wisconsin Univ., Madison. Mathematics Research Center.

HYDRODYNAMIC INTERACTIONS BETWEEN PARTICLES IN LOW-REYNOLDS-NUMBER FLOW: A MODULAR APPROACH Technical Summary Report

S. Kim Feb. 1984 31 p

(Contract DAAG29-80-C-0041)

(AD-A139269; MRC-TSR-2643) Avail: NTIS HC A03/MF A01 CSCL 12/1

A modular method for calculating hydrodynamic interactions between particles in low-Reynolds-number flow has been constructed by using multipole expansion solutions for the reflection field. The approach is made possible by the use of Faxen laws in relating the multipole moment to the incident field. The method is illustrated and checked by recalculating known expressions for the resistance and mobility tensors for two spheres. The method can be readily generalized to handle three-particle (or n-particle) interactions as shown in a following paper. New forms of the Faxen laws for prolate spheroids are given and will form the basis for other papers on spheroid-spheroid and spheroid-wall hydrodynamic interactions. The important result is that first-reflection solutions can be readily calculated even in cases where the ambient velocity field is obtained by a numerical procedure. These results, as asymptotic (far-field) solutions, furnish a check for more robust codes. In addition, these are important on their own since these provide crucial information for the renormalization theory used in suspension rheology. GRA

N84-23860# Calspan Field Services, Inc., Arnold Air Force Station, Tenn.

BOUNDARY LAYER TRIP PERFORMANCE TEST ON A 7-DEG CONE MODEL AT MACH NUMBER 8 Final Report, 1-6 Sep. 1983

S. M. Coulter and S. A. Simons Arnold AFS, Tenn. AEDC Oct. 1983 52 p Prepared in cooperation with Calspan Field Services, Inc., Arnold AFS, TN

(AD-A139408; AEDC-TSR-83-V41) Avail: NTIS HC A04/MF A01 CSCL 20/4

This study was performed to obtain additional knowledge of the physical characteristics and occurrences within a tripped boundary layer as well as determining suitable techniques for the measurement of these characteristics. A sharp, 7-deg half-angle cone model was tested in Mach 8 flow conditions at free-stream unit Reynolds numbers of 1.3- and 2.6-million per foot at zero angle of attack. Boundary layer surveys (pitot and total temperature), coax heat-gage, and model pressure data were acquired for comparison of a variety of boundary layer trip geometries.

Author (GRA)

N84-23861# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SWIRL AT GAS-INTAKE INLET

A. Y. Miroshnichenko 22 Feb. 1984 8 p Transl. into ENGLISH from Samolyotostroyeniye i Tekhn. Vozdushnogo Flota (USSR), no. 12, 1967 p 128-129

(AD-A139472; FTD-ID(RS)T-1801-83) Avail: NTIS HC A02/MF A01 CSCL 20/4

Formation of a swirl at a gas intake inlet promotes suction of solid particles into the gas intake from the Earth's surface, leading to damage of the machine. Damage is avoided by the use of a thick filter installed at the inlet to the suction line. In a number of cases this method proves to be completely unacceptable, due to the large hydraulic resistance of the filter. Flow visualization by various methods makes it possible to study this problem. Author

N84-23862# Air Force Geophysics Lab., Hanscom AFB, Mass.

SEISMO-ACOUSTIC EFFECTS OF SONIC BOOMS ON ARCHEOLOGICAL SITES, VALENTINE MILITARY OPERATIONS AREA

J. C. Battis 9 Nov. 1983 37 p

(AF Proj. 7600)

(AD-A139581; AFGL-TR-83-0304; AFGL-ERP-858) Avail: NTIS HC A03/MF A01 CSCL 20/1

Seismo-acoustic recordings of sonic booms were made at two sites in the Valentine Military Operations Areas (MOA). Each location was selected as representative of a class of significant archeological sites found within the MOA. These studies indicate that sonic booms are unlikely to cause damage to the archeological finds. The expected motions are, at worst, 8 percent of the limits set by strict blasting codes and comparable to velocities that could be produced by local earthquakes which have occurred in the Valentine area. At these levels of motion, competent rock will be unaffected by the transmission of seismic waves. The predicted velocity levels are unlikely to initiate either fracture or spalling in rocks. However, it is possible that in rocks where natural meteorological action has initiated these erosive mechanisms the sonic boom induced motion accelerate the processes to some small, and probably insignificant, degree. GRA

N84-23863# Karlsruhe Univ. (West Germany). Sonderforschungsbereich 80.

THEORETICAL STUDIES OF SOLID PARTICLES IN LAMINAR AND TURBULENT FLOWS

B. Schoenung and F. Durst Apr. 1983 190 p refs In GERMAN Sponsored by Deutschen Forschungsgemeinschaft

(KU-SFB-80/T/223) Avail: NTIS HC A09/MF A01

The effect of particle concentration profiles in vertical two-phase tube flows was investigated. A two-fluid model and a difference method were used. It is shown that radial particle migration velocities can cause radial pressure gradients. Comparison between calculated and measured pressure profiles shows that the gravitational effect of the disperse phase can be correctly calculated. Analytical calculations and experiments on the effect of a given particle concentration distribution in laminar flow show good agreement. Calculations and experiments in turbulent flows show that concentration profile dominates fluid flow. Migration forces and phenomena leading to the establishment of radial concentration profiles are calculated with a model.

Author (ESA)

N84-23864# Stanford Univ., Calif. Thermosciences Div.

EXPERIMENTAL MIXED CONVECTION HEAT TRANSFER FROM A LARGE, VERTICAL SURFACE IN A HORIZONTAL FLOW

Dennis L. Siebers, Richard G. Schwind, and Robert J. Moffatt Feb. 1983 208 p refs Sponsored in part by DOE and Sandia National Labs.

(HMT-36) Avail: NTIS HC A10/MF A01

The convective heat transfer from, and the boundary layer flow on, a large, vertical, heated, flat surface aligned parallel to a horizontal air flow were investigated in a wind tunnel. Interest in this problem follows from the effort to predict more accurately the heat losses from solar collectors. The heat transfer regimes evaluated ranged from pure forced, to mixed, to pure free convection with the primary emphasis upon mixed convection driven by orthogonal buoyant and inertia forces. The rate of convective heat transfer along with boundary layer velocity, flow angle, and temperature profiles were measured and evaluated. The transition zone from laminar to turbulent flow was located and shown to be affected by the free stream velocity, by buoyancy, and by variable properties. Significant attention is devoted to a presentation of the experimental apparatus and baseline evaluations. Recommendations for future work are discussed, with an emphasis upon quantitative investigation of turbulence for mixed convection flows. R.S.F.

N84-23572# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).

TURBULENT DIFFUSER FLOW STUDIES RELATED TO THE

DESIGN OF THE ETW DIFFUSER
H. W. Stock *In* Agard Wind Tunnels and Testing Tech. Feb. 1984 9 p refs Sponsored in part by Technical Group ETW, Amsterdam (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23576# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Berlin (West Germany). Abteilung Turbulenzforschung.
DEFINITION, SOURCES AND LOWEST POSSIBLE LEVELS OF WIND-TUNNEL TURBULENCE
Ulf Michel and Eberhard Froebel *In* Agard Wind Tunnels and Testing Tech. Feb. 1984 12 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23577*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AN EVALUATION OF FACTORS AFFECTING THE FLOW QUALITY IN WIND TUNNELS
F. K. Owen (Complere Inc., Palo Alto, Calif.), P. C. Stainback, and W. D. Harvey *In* Agard Wind Tunnels and Testing Tech. Feb. 1984 22 p refs (For primary document see N84-23564 14-01)
(Contracts NAS1-16643; NAS2-10859; NAS2-11080)
Avail: NTIS HC A22/MF A01 CSCL 20D

N84-23578# Dornier-Werke G.m.b.H., Munich (West Germany). Theoretical Aerodynamics.
PREDICTION OF CONDENSATION ONSET AND GROWTH IN THE EUROPEAN TRANSONIC WIND TUNNEL (ETW)
Bernhard Wagner and Michael Doker (DFVLR, Goettingen, West Germany) *In* Agard Wind Tunnels and Testing Tech. Feb. 1984 11 p refs Sponsored in part by the German Ministry of Research and Technology, and by the Technical Group ETW, Amsterdam (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23579# Douglas Aircraft Co., Inc., Long Beach, Calif. Aerodynamics Subdiv.
NONADIABATIC MODEL WALL EFFECTS ON TRANSONIC AIRFOIL PERFORMANCE IN A CRYOGENIC WIND TUNNEL
F. T. Lynch, M. F. Fancher, D. R. Patel, and G. R. Inger (West Virginia Univ., Morgantown) *In* Agard Wind Tunnels and Testing Tech. Feb. 1984 11 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23598# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
VORTICAL FLOW EXPLORATION METHODS DEVELOPED FOR THE F1 WIND TUNNEL
Yves Brocard and Philippe Desplas *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 15 p refs In FRENCH; ENGLISH summary (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-24175# Wisconsin Univ., Madison. Mathematics Research Center.
INSTABILITY OF THE FLOW OF TWO IMMISCIBLE LIQUIDS WITH DIFFERENT VISCOSITIES IN A PIPE
D. D. Joseph, M. Renardy, and Y. Renardy *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 27-36 (For primary document see N84-24173 14-59)
(Contract DAAG29-80-C-0041)
(AD-P002935) Avail: NTIS HC A99/MF A01 CSCL 20/4

N84-24176# Ballistic Research Labs., Aberdeen Proving Ground, Md.
NUMERICAL SIMULATION OF THE FLOW OF A CHEMICAL CONTAMINANT SUBJECTED TO A JET IMPINGEMENT
L. M. Chang *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 37-53 (For primary document see N84-24173 14-59)
(AD-P002936) Avail: NTIS HC A99/MF A01 CSCL 20/4

N84-24177# Minnesota Univ., Minneapolis. Dept. of Aerospace Engineering and Mechanics.
NONUNIQUENESS AND STABILITY OF THE CONFIGURATION OF FLOW OF IMMISCIBLE FLUIDS WITH DIFFERENT VISCOSITIES
D. D. Joseph, K. Nguyen, and G. S. Beavers *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 55-115 (For primary document see N84-24173 14-59)
(AD-P002937) Avail: NTIS HC A99/MF A01 CSCL 20/4

N84-24178# Wisconsin Univ., Madison.
FLOW PAST A FLEXIBLE MEMBRANE
J. M. Vanden-Broeck *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 117-123 (For primary document see N84-24173 14-59)
(Contract DAAG29-80-C-0041; Grant NSF MCS-80-01960)
(AD-P002938) Avail: NTIS HC A99/MF A01 CSCL 20/4

N84-24200# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mathematics.
NUMERICAL BOUNDARY CONDITIONS FOR FLOW PROBLEMS
G. J. Fix and M. D. Gunzburger *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 567-580 (For primary document see N84-24173 14-59)
(Contract DAAG29-83-K-0084)
(AD-P002960) Avail: NTIS HC A99/MF A01 CSCL 12/1

N84-24201# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mathematics.
LEAST SQUARES APPROXIMATIONS TO COMPRESSIBLE FLOW PROBLEMS
G. J. Fix and M. D. Gunzburger *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 581-585 (For primary document see N84-24173 14-59)
(Contract DAAG29-83-K-0084)
(AD-P002961) Avail: NTIS HC A99/MF A01 CSCL 12/1

N84-24206# Science Applications, Inc., Pleasanton, Calif.
MOVING FINITE ELEMENT RESEARCH FOR SHOCK HYDRODYNAMICS, CONTINUUM MECHANICS AND COMBUSTION
R. J. Gelinas, S. K. Doss, and N. N. Carlson *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 753-772 (For primary document see N84-24173 14-59)
(AD-P002970) Avail: NTIS HC A99/MF A01 CSCL 12/1

N84-24207# Catholic Univ. of America, Washington, D.C. Dept. of Physics.
ELASTIC WAVE SCATTERING FROM CYLINDRICAL CAVITIES AND SOLID INCLUSIONS ANALYZED BY THE RESONANCE METHOD
P. P. Delsanto, J. D. Alemar, A. Nagl, J. V. Subrahmanyam, and H. Uberall *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 773-784 (For primary document see N84-24173 14-59)
(AD-P002971) Avail: NTIS HC A99/MF A01 CSCL 12/1

N84-24210# Illinois Univ., Urbana. Dept. of Theoretical and Applied Mechanics.
NEAR CHAPMAN-JOUGET DETONATIONS
D. S. Stewart and G. S. S. Ludford *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 801-811 (For primary document see N84-24173 14-59)
(AD-P002974) Avail: NTIS HC A99/MF A01 CSCL 19/4

N84-24211# Cornell Univ., Ithaca, N.Y. Dept. of Theoretical and Applied Mechanics.
ARE DETONATIONS STEADY?
A. A. Oyediran and G. S. S. Ludford *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 813-816 (For primary document see N84-24173 14-59)
(AD-P002975) Avail: NTIS HC A99/MF A01 CSCL 19/4

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N84-23865*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EVALUATION TESTS OF PLATINUM RESISTANCE THERMOMETERS FOR A CRYOGENIC WIND TUNNEL APPLICATION
Edward F. Germain and E. Conrad Compton Apr. 1984 17 p refs
(NASA-TM-85803; NAS 1.15:85803) Avail: NTIS HC A02/MF A01 CSCL 14B

Thirty-one commercially designed platinum resistance thermometers were evaluated for applicability to stagnation temperature measurements between -190 C and +65 C in the Langley Research Center's National Transonic Facility. Evaluation tests included X-ray shadowgraphs, calibrations before and after aging, and time constant measurements. Two wire-wound low thermal mass probes of a conventional design were chosen as most suitable for this cryogenic wind tunnel application. Author

N84-23866*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THERMAL DETECTORS AS X-RAY SPECTROMETERS
S. H. Moseley, J. C. Mather, and D. McCammon Apr. 1984 27 p refs
(NASA-TM-86092; NAS 1.15:86092) Avail: NTIS HC A03/MF A01 CSCL 14B

Sensitive thermal detectors should be useful for measuring very small energy pulses, such as those produced by the absorption of X-ray photons. The measurement uncertainty can be very small, making the technique promising for high resolution nondispersive X-ray spectroscopy. The limits to the energy resolution of such thermal detectors are derived and used to find the resolution to be expected for a detector suitable for X-ray spectroscopy in the 100 eV to 10,000 eV range. If there is no noise in the thermalization of the X-ray, resolution better than 1 eV full width at half maximum is possible for detectors operating at 0.1 K. Energy loss in the conversion of the photon energy to heat is a potential problem. The loss mechanisms may include emission of photons or electrons, or the trapping of energy in long lived metastable states. Fluctuations in the phonon spectrum could also limit the resolution if phonon relaxation times are very long. Conceptual solutions are given for each of these possible problems. Author

N84-23867# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DEVICE FOR MARKING AND SEARCHING FOR INFORMATION ON A MAGNETIC CARRIER
G. I. Brodov, V. N. Barabanov, and V. S. Pereyaslov 6 Mar. 1984 6 p Transl. into ENGLISH of Russian Patent no. 346737 (28 Jul. 1982) p 1-2
(AD-A139393; FTD-ID(RS)T-1827-83) Avail: NTIS HC A02/MF A01 CSCL 14/3

A device for marking and searching for information on a magnetic carrier is described. In order to increase the noise immunity and reliability of the data recording and reading paths, the recording head is included between the amplifier of the clock pulses for the master oscillator and through the amplifier of the code pulses for the logical element unit. The reproduction head is connected through the code pulse shaper-amplifier with a switch which is connected with the display unit, and through another analogous clock pulse amplifier with a multivibrator. R.J.F.

N84-23868# Engineering Development Establishment, Maribyrnong (Australia).
SYNCHRONIZATION TECHNIQUE OF DATA RECORDED ON A MULTICHANNEL TAPE RECORDER
J. D. Dickens Jan. 1984 15 p
(AD-A139570; EDE-1/84) Avail: NTIS HC A02/MF A01 CSCL 14/3

This document describes the design and development of a portable, self-contained, electronic digital unit, termed Data Synchronizer. This unit is able to time synchronize recorded data channels from a multichannel tape recorder during playbacks. During the data recording, it produces a synchronization signal which is recorded on one channel using direct or Frequency Modulation techniques. The recording/playback speed ratio may be varied to suit the analysis method. GRA

N84-23869# National Bureau of Standards, Washington, D.C.
FIBEROPTIC PROBE FOR MEASURING HIGH FREQUENCY TEMPERATURE FLUCTUATIONS IN COMBUSTION GASES
R. R. Dils and D. A. Tichenor (Sandia Labs., Livermore, Calif.) Feb. 1984 37 p refs Presented at Spring Meeting of the Combust. Inst., Boulder, Colo., 2 Apr. 1984
(Contract DE-AC04-76DP-00789)
(DE84-006784; SAND-83-8871; CONF-8404104-1) Avail: NTIS HC A03/MF A01

A fiberoptic probe for measuring high frequency gas temperature fluctuations is described. The fiberoptic probe is an optical pyrometer in which the thermal radiation is transmitted through an optical fiber. The key element in the device is a high temperature optical fiber made of single crystal aluminia (sapphire), which remains transparent and nonemitting in the optical and near infrared at temperatures up to its melting point. Thermal radiation from the metallic thin film is collected by the high temperature fiber and transmitted through the conventional optical fiber to a detector assembly. The radiation is then transmitted through a band pass filter, and the intensity is measured using a photodetector. The frequency response of the fiberoptic probe is inherently superior to that of fine wire thermocouples. The output of a thermocouple depends on the internal temperature of the wire. The capability of measuring temperature fluctuations up to 14 KJz in combustor exhaust gases is demonstrated. DOE

N84-23870# Argonne National Lab., Ill.
PORTABLE DEVICE FOR DETECTING AND IDENTIFYING HAZARDOUS VAPORS
J. R. Stetter, S. Zaromb, W. R. Penrose, M. W. Findlay, T. Otawaga, and A. J. Sincali (Coast Guard, Washington, D.C.) 9 Apr. 1984 19 p refs Presented at Hazardous Mater. Spills Conf., Nashville, 9 Apr. 1984
(Contract W-31-109-eng-38)
(DE84-003640; CONF-840475-1) Avail: NTIS HC A02/MF A01

A portable device that can detect, identify, and then warn US Coast Guard emergency response personnel of the presence of hazardous concentrations of toxic vapors is being developed by Argonne National Laboratory. The device should help prevent accidental exposures to such vapors. A first prototype of the device uses an array of four different toxic gas sensors, each of which can rapidly be switched to any one of four differently selective operating modes. This yields a total of 16 measured parameters or 16 independent data channels whose information content may eventually suffice to identify up to 74 hazardous species, either individually or in mixtures of up to three of these species in air. The first prototype is designed to detect and identify about 25 selected hazardous compounds. It operates on batteries, is housed in a carrying case about 12 in. by 7 in. by 4 in., and weighs about 8 lb. The instrument can be operated in an identification mode or a monitoring mode. DOE

N84-23871# Fermi National Accelerator Lab., Batavia, Ill.
MEASUREMENT OF THE ENERGY RESOLUTION AND RELATED PROPERTIES OF AN SCG1-C SCINTILLATION GLASS SHOWER COUNTER ARRAY FOR 1 TO 25 GeV POSITRONS
D. E. Wagoner, B. Cox, D. J. Judd, G. Hale, P. O. Mazur, C. T. Murphy, R. Rameika, F. Turkot, S. Conetti, M. Haire et al Jan. 1984 10 p refs Presented at the Nucl. Sci. Symp., San Francisco,

19-21 Oct. 1983 Prepared in cooperation with McGill Univ., Montreal and Stanford Linear Accelerator Center, Calif. and Athens Univ., Greece Sponsored in part by National Sciences and Engineering Council of Canada, the Quebec Dept. of Education and the Hellenic Science and Technology Agency
(Contract DE-AC02-76CH-03000)
(DE84-007246; FERMILAB-Conf-84/21-E; CONF-831015-40) Avail: NTIS HC A02/MF A01

The measurement of the energy resolution of a 4 x 4 array of SCG1-C scintilation glass counters exposed to positrons in the energy range of 1 to 25 GeV is reported. Each element of the array was 20.5 radiation lengths long. The resolution of the array was measured both with and without a 3.5 radiation length SCG1-C scintillation glass active converter and 0.2 radiation length hodoscopes used to measure shower position. An energy resolution sigma/E = (1.63 + 1/46/ (RADICAL)E)% was obtained without the active converter and sigma/E = (0.64/ (RADICAL)E)% with the active converter. Performing a partial correction for the average energy loss in the 0.2 radiation length hodoscopes resulted in an energy resolution of sigma/E = (0.50 + 3.43/ (RADICAL)E)% for the active converter measurement. The measurement of the absolute number of photons produced by 1 GeV showers, the optical attenuation length for the light produced by showers, the fraction or the total light output that is due to Cerenkov light relative to scintillation light for showers, and the radiation darkening sensitivity of the scintillation glass are also reported. E.A.K.

N84-23872# California Univ., Livermore. Lawrence Livermore Lab.
L-DIVISION STREAK CAMERA
P. C. Schaich and L. B. Olk 21 Feb. 1984 113 p
(Contract W-7405-eng-48)
(DE84-007780; LLL/M-149) Avail: NTIS HC A06/MF A01

The purpose of a streak camera is to display a transient flash of light from a point source as a linear streak. The spatial points in the streak correspond to the temporal sequence of intensities in the brightness distribution of the flash. The streak camera discussed is a modular system with a streak tube, control logic, and some pulsers which facilitate setting up experiments. The specifications of the streak camera and its various components are described. Operating instructions are given along with the theory of operation. The use of the optoliner in the laboratory as an aid to experimental design is also discussed. The initial set up of a streak tube is described in detail. DOE

N84-23873# Sandia Labs., Albuquerque, N. Mex.
HELICAL SCREW RHEOMETER: A NEW CONCEPT IN ROTATIONAL RHEOMETRY
A. M. Kraynik, J. H. Aubert, R. N. Chapman, and D. C. Gyure 1984 18 p refs Presented at Soc. of Plastics Engr. Ann. Tech. Conf. and Exhibit, New Orleans, 30 Apr. 1984
(Contract DE-AC04-76DP-00789)
(DE84-004055; SAND-83-1222C; CONF-840474-1) Avail: NTIS HC A02/MF A01

The helical screw rheometer represents a new concept in viscometry: a rotational instrument that generates a pressure difference and therefore does not require torque measurement. The device is basically a metering screw that operates with no discharge. The results that are necessary to obtain the power-law constitutive parameters from pressure drop and rotation rate data are presented along with comparisons between theory and experiment for a prototype instrument operated at ambient conditions. The helical screw rheometer may offer advantages over conventional instruments for: (1) high-pressure measurements; (2) chemically-reacting fluids; (3) heterogeneous fluids; and (4) on-line measurements. DOE

N84-23738 Technische Hochschule, Aachen (West Germany). Gemeinschaftslab. fuer Elektronenmikroskopie.
ELECTRON MICROSCOPY FOR DAMAGE ANALYSIS [ELEKTRONENMIKROSKOPIE BEI DER SCHADENSANALYSE]
Michael Pohl *In* Deut. Ges. fuer Metallkunde e.V. Systematic Evaluation of Tech. Causes of Damage 1983 p 49-77 refs In GERMAN Original language document announced as A84-24430 (For primary document see N84-23734 14-26)
Avail: Issuing Activity

N84-23874# Hughes Aircraft Co., Torrance, Calif. Electron Dynamics Div.
DEVELOPMENT PROGRAM FOR A 200kW, CW GYROTRON Quarterly Report, Jan. - Mar. 1983
J. J. Tancredi, W. J. DeHope, P. E. Ferguson, S. L. Hart, V. A. Matranga, J. J. Sandoval, and M. J. Schmitt 1983 40 p refs
(Contract W-7405-eng-26)
(DE84-007945; ORNL/Sub-79-33200/15; QR-15) Avail: NTIS HC A03/MF A01

A millimeter wave device to produce 200 kW of continuous wave power at 60 GHz was developed. The device, a gyrotron oscillator, will be compatible with power delivery to an electron cyclotron heated plasma. Smooth control of RF power over a 17 dB range is required, and the device should be capable of operation into a severly time varying load mismatch. Long pulse testing continues on gyrotrons S/N 1A and 2A. While testing S/N 1A at 181 kW and 60 ms pulse width, a window failure occurred which attributed to a faulty arch detector. Long pulse testing up to 207 kW is achieved, on S/N 2A at 100 ms pulse width. DOE

N84-23875# Sandia Labs., Albuquerque, N. Mex. Physical Standards Div.
INTERCOMPARISON OF ZINC FREEZING POINT CELLS AND STANDARD PLATINUM RESISTANCE THERMOMETERS
Robert N. Roberts Feb. 1984 13 p refs
(Contract DE-AC04-76DP-00789)
(DE84-007440; SAND-83-2477) Avail: NTIS HC A02/MF A01

Four standard platinum resistance thermometers (SPRTs) and four zinc freezing point cells were compared. Pronounced differences are found between the SPRTs but no differences are found between the cells. Interaction between cells and SPRTs in two instances is indicated. It is found that one interaction is spurious because of an anomalous data point. No grounds are found for discounting the validity of the second interaction. DOE

N84-23876# National Bureau of Standards, Washington, D.C. Center for Basic Standards.
STANDARD REFERENCE MATERIALS (SRM) 1969: RUBIDIUM TRIPLE-POINT STANDARD: A TEMPERATURE REFERENCE STANDARD NEAR 39.30C Final Report
B. W. Mangum Dec. 1983 40 p refs
(PB84-149996; NBS-SP-260-87; LC-83-600621) Avail: NTIS HC A03/MF A01 CSCL 14B

Standard Reference Material (SRM) 1969 - the Rubidium Triple-Point Standard is discussed. Results of an investigation of 100 SRM 1969 cells are given. The tests which were performed on the cells, the conditions under which the cells were tested, the results of the tests, and the recommended procedure for the use of SRM 1969 in calibrating thermometers are discussed. The use of SRM 1969 in clinical and biomedical laboratory applications should significantly enhance the accuracy of temperature measurements in the region of body temperature. Author (GRA)

N84-23877# National Bureau of Standards, Washington, D.C. Center for Electronics and Electrical Engineering.
MEASUREMENT TECHNIQUES FOR HIGH-RESISTIVITY DETECTOR-GRADE SILICON Progress Report, 1 Jul. 1982 - 30 Jun. 1983
Robert D. Larrabee and Jeremiah R. Lowney Dec. 1983 22 p refs Sponsored in part by Army Electronics Research and Development Command, Ft. Monmouth, N.J.
(PB84-155902; NBSIR-83-2792) Avail: NTIS HC A02/MF A01 CSCL 14B

Techniques for nondestructively characterizing the resistivity and excess-carrier recombination lifetime in ingots of high-resistivity, long-lifetime detector-grade silicon are evaluated. In particular, three interrelated techniques for nondestructively: measuring an average resistivity, profiling the low-level excess-carrier lifetime, and profiling the resistivity of cylindrical specimens are proposed and are in

the process of being evaluated. All three techniques treat the ingot under test as a large van der Pauw specimen and require removable silver-paste contacts or pressed-on capacitive contacts. The profiling measurements use a highly penetrating 1.15 micrometer He-Ne laser beam as an optical probe. The conceptual and theoretical background for these measurements and the results of feasibility experiments are presented. Author (GRA)

N84-23805# Joint Publications Research Service, Arlington, Va.
FIRST INFRARED RADIATION DETECTOR Abstract Only
In its East Europe Rept.: Sci. Affairs (JPRS-ESA-84-009) 21 Mar. 1984 p 19-20 Transl. into ENGLISH from Polish Eng. (Warsaw), no. 3, Mar. 1983 p 17 (For primary document see N84-23802 14-31)
Avail: NTIS HC A03/MF A01

N84-24453# Akademiya Nauk BSSR, Minsk. Inst. of Physics.
VACUUM-DEPOSITED THIN-FILM INTERFEROMETERS AS BISTABLE DEVICES OPERATING CONTINUOUSLY AT ROOM TEMPERATURE Abstract Only
S. F. Apanasevich, F. V. Karpushko, and G. V. Sinitsyn *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 14/2

36 LASERS AND MASERS

Includes parametric amplifiers.

N84-23878*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INTENSITY AND ABSORBED-POWER DISTRIBUTION IN A CYLINDRICAL SOLAR-PUMPED DYE LASER
M. D. Williams 1984 18 p refs
(NASA-TP-2321; L-15694; NAS 1.60:2321) Avail: NTIS HC A02/MF A01 CSCL 20E

The internal intensity and absorbed-power distribution of a simplified hypothetical dye laser of cylindrical geometry is calculated. Total absorbed power is also calculated and compared with laboratory measurements of lasing-threshold energy deposition in a dye cell to determine the suitability of solar radiation as a pump source or, alternatively, what modifications, if any, are necessary to the hypothetical system for solar pumping. Author

N84-23879*# Johns Hopkins Univ., Baltimore, Md. Dept. of Electrical Engineering and Computer Science.
OPTICAL COMMUNICATION WITH LASER DIODE ARRAYS Interim Status Report, Aug. 1983 - Feb. 1984
F. Davidson May 1984 31 p refs
(Grant NAG5-356)
(NASA-CR-173533; NAS 1.26:173533) Avail: NTIS HC A03/MF A01 CSCL 20E

The performance of a direct-detection optical communication system in which the laser transmitter sends short optical pulses of selected nonoverlapping center frequencies is analysed. This modulation format, in which a single light pulse is sent in one of M time slots at one of N optical center frequencies, is referred to as color coded optical pulse position modulation (CCPPM). The optimum energy-efficiency of this system, as measured by the channel capacity in nats per photon, exceeds that of ordinary optical pulse position modulation which uses a pulsed laser of fixed optical frequency. Reliable communication at optimal energy efficiency is easily achieved through the use of modest block length Reed-Solomon codes with the code words represented as CCPPM symbols. Author

N84-23880*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
ATOMIC HYDROGEN FOR LOW TEMPERATURE ATOMIC HYDROGEN MASERS AND IN-VACUUM DISSOCIATORS FOR VLG-11 SERIES MASERS Final Report
Robert F. C. Vessot Apr. 1984 26 p refs
(Grant NsG-8012)
(NASA-CR-173506; NAS 1.26:173506) Avail: NTIS HC A03/MF A01

The operation of a cryogenically-cooled hydrogen maser using an RF plasma dissociator operating at liquid nitrogen temperature (77K) in confunction with a state selector magnet whose dimensions are suitable for slow atoms is studied. The focusing characteristics for a hexapole state selector magnet with maximum fields at the pole tips, provide a maximum acceptance angle for atoms at the most probable velocity in the beam. By thermally isolating the RF circuitry from the dissociator glassware, only dielectric losses in the glass and the energy coupled to the plasma will result in the boil-off of liquid nitrogen. It is estimated that this is about one watt and thus a loss rate of approximately .022 liters pr hour is anticipated. A.R.H.

N84-23881# Schafer (W. J.) Associates, Inc., Wakefield, Mass.
PROOF OF PRINCIPLE EXPERIMENT FOR A COHERENT CO2 WAVEGUIDE LASER ARRAY Final Report, 1 Jul. 1982 - 3 Oct. 1983
D. G. Youmans, E. Locke, E. Hoag, and G. Zeiders Wright-Patterson AFB, Ohio AFWAL Jan. 1984 39 p
(Contract F33615-82-C-2217; AF Proj. 2301)
(AD-A139121; WJSA-FR-83-241; AFWAL-TR-83-2094) Avail: NTIS HC A03/MF A01 CSCL 20/5

A method is investigated to increase the output of small carbon dioxide waveguide lasers by coupling several waveguides using leaky modes through the waveguide walls. The theoretical part of the work established the advantages of the coupled mode operation versus output from a corresponding array of uncoupled waveguide lasers as the increase of the power in the bucket in the far field. The problems of optimum gas mixtures and questions of thermal management are treated also. An experimental test of suitable waveguide materials showed that relatively rough surfaced and therefore less expensive zinc selenide (ZnSe) material has sufficiently low losses. Initial experiments using RF excitation into the waveguides or one single waveguide were unsuccessful due to difficulties in matching RF generator and load. Operation with DC resulted in output powers meeting specifications. A test of two parallel waveguides separated by a ZnSe wall showed coupling of the two lasing channels, if they operated on the same laser transition. This was tested with a pyroelectric detector array which showed the coherent summation of the two far field patterns.
Author (GRA)

N84-23882# Illinois Univ., Urbana. Dept. of Aeronautical and Astronautical Engineering.
NONLINEAR INTERACTIONS BETWEEN THE PUMPING KINETICS, FLUID DYNAMICS AND OPTICAL RESONATOR OF CW FLUID FLOW LASERS Final Technical Report
L. H. Sentman and M. H. Nayfeh Dec. 1983 51 p
(Grant AF-AFOSR-0133-80; AF Proj. 2303)
(AD-A139189; AAE-83-10; UILU-ENG-83-0510; AFOSR-84-0147TR) Avail: NTIS HC A04/MF A01 CSCL 20/5

This research is an integrated theoretical and experimental investigation of the nonlinear interactions which may occur between the chemical kinetics, the fluid dynamics and the unstable resonator of a continuous wave fluid flow laser. The objectives of this grant were to measure the frequency and amplitude of the time dependent pulsations in the power spectral output which have been predicted to occur in CW chemical lasers employing unstable resonators to extract power. GRA

N84-23883# Dartmouth Coll., Hanover, N.H.
A CERENKOV-RAMAN MASER Ph.D. Thesis
K. O. Busby May 1980 169 p
(Contract N00014-79-C-0760)
(AD-A139275) Avail: NTIS HC A08/MF A01 CSCL 20/5

The first observations of coherent microwave radiation resulting from Cerenkov-Raman backscattering have been made and are reported. An extensive experimental investigation of vacuum Raman backscattering has also been made. Theoretical models are presented to calculate the frequency and the gain at interaction

for both the Raman and the Cerenkov-Raman backscattering interactions. Experimental data are compared to theoretical predictions. Author (GRA)

N84-23884# Naval Research Lab., Washington, D. C.
STUDY OF GAIN, BANDWIDTH, AND TUNABILITY OF A MILLIMETER-WAVE FREE-ELECTRON LASER OPERATING IN THE COLLECTIVE REGIME
S. H. Gold, W. M. Black, H. P. Freund, V. L. Granatstein, and R. H. Jackson 29 Feb. 1984 26 p
(F68-342)
(AD-A139285; NRL-MR-5106) Avail: NTIS HC A03/MF A01 CSCL 20/5

Frequency-resolved measurements of the emission of a collective free-electron laser operating at millimeter wavelengths have shown emission spectra that agree with theoretical predictions for the collective free-electron laser instability. Broad tunability, moderate emission linewidths, and high single frequency gain have been observed. In addition, adjusting the axial field in the end region of the interaction has been found in some cases to cause a large increase in measured power and efficiency. Author (GRA)

N84-23885# Lincoln Lab., Mass. Inst. of Tech., Lexington.
COHERENT LASER RADAR REMOTE SENSING Final Report, 1 Oct. 1982 - 30 Sep. 1983
R. J. Hull, D. G. Biron, S. Marcus, and J. H. Shapiro 30 Sep. 1983 64 p
(Contract F19628-80-C-0002; AF Proj. 1900)
(AD-A139448; ESD-TR-83-238; ESL-TR-83-72) Avail: NTIS HC A04/MF A01 CSCL 20/5

This report summarizes the technical effort accomplished in FY83 on a program to make range-resolved measurements of chemical agents or pollutants distributed within the atmosphere. A description of the modified receiver electronics which permit rapid accumulation of a very large number of signal returns is described. The performance of a rapidly tunable CO2 laser is discussed. Theoretical analyses of coherent laser radar systems including mixing efficiencies, speckle effects, and waveform performance are reported. GRA

N84-23886# Naval Research Lab., Washington, D. C.
A HIGH-GAIN 35 GHz FREE-ELECTRON LASER AMPLIFIER EXPERIMENT
S. H. Gold, D. L. Hardesty, A. K. Kinkead, L. R. Barnett, and V. L. Granatstein 20 Mar. 1984 14 p
(DA Proj. RR0-1109)
(AD-A139593; NRL-MR-5301) Avail: NTIS HC A02/MF A01 CSCL 20/5

A new intense-beam free-electron laser experiment, operating as a short-pulse amplifier at 35 GHz, has demonstrated linear growth rates of 1.2 dB/cm, total gain of 50 dB, and coherent emission of 17 MW, corresponding to an experimental efficiency of greater than 3%. Author (GRA)

N84-23887# California Univ., Livermore. Lawrence Livermore Lab.
THE 1982 LASER PROGRAM Annual Report
Charles D. Hendricks, ed. and Gerald R. Grow, ed. Aug. 1983 481 p refs
(Contract W-7405-eng-48)
(DE84-006476; UCRL-50021-82) Avail: NTIS HC A21/MF A01

The laser application program is reported in eight sections: (1) laser program review; (2) laser systems and operation; (3) target design; (4) target fabrication; (5) fusion experiments program; (6) Zeus laser project; (7) laser research and development; and (8) energy applications. DOE

N84-23888# Sandia Labs., Albuquerque, N. Mex.
LASER-INDUCED ETCHING OF INSULATORS USING A dc GLOW DISCHARGE IN SILANE
J. M. Gee and P. J. Hargis, Jr. 1984 11 p refs Presented at the SPIE Techn. Symp. and Instrument Exhibit, Los Angeles, 22 Jan. 1984
(Contract DE-AC04-76DP-00789)
(DE84-007570; SAND-83-2064C; CONF-840139-3) Avail: NTIS HC A02/MF A01

A new method of laser-controlled etching in which the radiation from a pulsed-ultraviolet excimer laser is used to etch inorganic insulators exposed to plasma species that were produced in a glow discharge sustained in silane is discussed. The maximum etch rate achieved was 50 nm/min for thin-film silicon dioxide. DOE

N84-23889# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
THEORETICAL AND EXPERIMENTAL INVESTIGATIONS FOR THE CONSTRUCTION OF A CONTINUOUS, RF-EXCITED WAVEGUIDE CO2-LASER WITH HIGH FREQUENCY TUNABILITY AND HIGH OUTPUT POWER [THEORETISCH UND EXPERIMENTELLE UNTERSUCHUNGEN ZUM BAU EINES KONTINUIERLICHEN, HF-ANGERENGTEN WELLENLEITER-CO2-LASERS MIT HOHER FREQUENZABSTIMMBARKEIT BEI HOHER AUSGANGSLEISTUNG]
G. Merkle Jan. 1983 112 p refs In GERMAN; ENGLISH summary
(IPF-83-1) Avail: NTIS HC A06/MF A01

A line and frequency tunable waveguide CO2 laser of several watts CW output power for pumping FIR lasers and plasma diagnostic applications was developed. A Fox-Smith mode selector was integrated into the waveguide laser cavity to overcome tuning range limitations. Output powers > 5 W are obtained with the RF excited waveguide laser in a plane/plane mirror configuration. With the mode selector, including a grating for line selection, the laser emits > 2 W with a tuning range broader than 500 MHz. Author (ESA)

N84-23890# Unisearch Associates, Inc., Concord (Ontario).
MEASUREMENT OF NO, NO/SUB 2, AND HNO/SUB 3 USING A TUNABLE DIODE LASER SYSTEM. PHASE 2: MODIFICATION TO PERMIT AUTOMATED SIMULTANEOUS MULTI-SPECIES MONITORING AND FEASIBILITY STUDY OF EXTENSION TO H/SUB 2O/SUB 2, CH/SUB 2O AND HONO Progress Report
G. I. Mackay, T. Iguchi, and H. I. Schiff 15 Nov. 1983 49 p Sponsored by the Coordinating Research Council, Inc.
(PB84-160076; CRC-APRAC-CAPA-17/19-80) Avail: NTIS HC A03/MF A01 CSCL 14B

The tropospheric air monitoring system (TAMS) was modified to permit nearly simultaneous monitoring of two or more species. The system was developed to allow for computer control of the laser systems and computer data acquisition which could provide real time data analysis. The system can monitor at least two of NO, NO2, and HNO3 nearly simultaneously (within five seconds) in the troposphere at sub-part-per-billion-by-volume (ppbv) levels. A second task was to perform studies on additional species to determine the feasibility of using the TAMS in their detection. This was done for three species: H2O2, CH2O, and HONO. Lasers were obtained for all three species, and regions in their absorption spectrums free from interferences due to other tropospheric constituents were identified. Detection limits of less than a few ppbv were determined for H2O2 and CH2O and were measured in doped by synthetic air and in ambient laboratory air. Author (GRA)

N84-24386# Milan Univ. (Italy). Ist. di Fisica.
SELF-PULSING,BREATHING AND CHAOS IN OPTICAL BISTABILITY AND THE LASER WITH INJECTED SIGNAL
L. A. Lugiato and L. M. Narducci (Drexel Univ.) *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/5

N84-24400# Rochester Univ., N. Y. Inst. of Optics.
BISTABLE OPERATION OF TWO SEMICONDUCTOR LASERS IN AN EXTERNAL CAVITY: RATE-EQUATION ANALYSIS
T. G. Dziura (Lab. for Laser Energetics) and D. G. Hall *In* Opt.

Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/5

N84-24411# Rochester Univ., N. Y. Inst. of Optics.
INTRINSIC INSTABILITIES IN HOMOGENEOUSLY BROADENED LASERS Abstract Only
Lloyd W. Hillman, Robert W. Boyd, Jerzy Krasinski, and C. R. Stroud, Jr. *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/5

N84-24430# Warsaw Univ. (Poland). Inst. of Theoretical Physics.
ABSORPTIVE OPTICAL BISTABILITY WITH LASER AMPLITUDE FLUCTUATIONS Abstract Only
M. Kus, K. Wodkiewicz, and J. A. C. Gallas (Max-Planck-Inst. of Quantum Optics) *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 1p (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/5

N84-24431# Pisa Univ. (Italy). Gruppa Nazionale di Struttura della Materia.
PRECISE MEASUREMENTS OF BISTABILITY IN A CO/SUB 2 LASER WITH INTRACAVITY SATURABLE ABSORBER
E. Arimondo, B. M. Dinelli, and E. Menchi *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/5

N84-24433# Milan Univ. (Italy). Dipt. de Fisica.
EFFECTS OF THE RADIAL VARIATION OF THE ELECTRIC FIELD ON SOME INSTABILITIES IN LASERS AND IN OPTICAL BISTABILITY Abstract Only
L. A. Lugiato and M. Milani *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/5

N84-24438# Essen Univ. (West Germany). Fachbereich Physik.
SELF-PULSING AND CHAOS IN INHOMOGENEOUSLY BROADENED SINGLE-MODE LASERS
R. Graham and Y. Cho (Osaka Univ.) *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24439# Akademiya Nauk BSSR, Minsk. Inst. of Physics.
SELFPULSING, HYSTERESIS AND CHAOS IN A STANDING WAVE LASER
L. A. Kotomtseva, N. A. Loiko, and A. M. Samson *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24440# Zurich Univ. (Switzerland). Physik-Inst.
THE NMR LASER: A NONLINEAR SOLID STATE SYSTEM SHOWING CHAOS Abstract Only
E. Brun, B. Derighetti, R. Holzner, and D. Meier *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 1p (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/5

N84-24452# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
LIGHT-INDUCED NONRECIPROCITY: DIRECTIONAL OPTICAL BISTABILITY; SPECTROSCOPY OF INDUCED ANISOTROPY; NONLINEAR SAGNAC EFFECT Abstract Only
A. E. Kaplan *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/5

N84-24455# California Inst. of Tech., Pasadena.
BISTABLE INJECTION LASERS
C. Harder, K. Y. Lau, and A. Yariv *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs Sponsored in part by ONR, NSF and ARO (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/5

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N84-23891*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TRIBOLOGY IN THE 80'S. VOLUME 1: SESSIONS 1 TO 4
Apr. 1984 508 p refs Conf. held at NASA. Lewis Research Center, 18-21 Apr. 1983 2 Vol.
(NASA-CP-2300-Vol-1; E-1559; NAS 1.55:2300-Vol-1) Avail: NTIS HC A22/MF A01 CSCL 11H

A wide range of subjects extending from fundamental research with tribological materials and their surface effects up to the final applications in mechanical components were covered. For individual titles, see N84-23892 through N84-23909.

N84-23892*# Cambridge Univ. (England).
STATUS AND DIRECTION OF TRIBOLOGY AS A SCIENCE IN THE 80'S. UNDERSTANDING AND PREDICTION
David Tabor *In* NASA Lewis Research Center Tribology in the 80's. Vol. 1 Apr. 1984 p 1-17 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01 CSCL 11H

The most challenging research problems in tribology for the next decade or beyond are classified horizontally into two categories: (1) understanding of basic mechanisms and (2) prediction of practical performance. Vertical classifications are in terms of particular themes or fields of interest. Areas where more fundamental work is required are: adhesion and friction of clean and contaminated surfaces; lubrication; new materials; surface characterization at the engineering level (topography) and at the atomic levels (various spectroscopies); and wear. Author

N84-23893*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
IMPORTANCE AND DEFINITION OF MATERIALS IN TRIBOLOGY. STATUS OF UNDERSTANDING c27
Donald H. Buckley *In its* Tribology in the 80's. Vol. 1 Apr. 1984 p 19-44 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01 CSCL 11H

In general, tribological systems consist of three basic components: the material surfaces in contact, the lubricant, and the environment. The materials in contact and the influence of both bulk and surface properties, indicating the importance of material characterization, on tribological behavior are addressed. Since metals and metallic alloys are the most widely used class of materials in practical devices, attention is focused principally on them. With respect to surface behavior, the effect of contaminants both from within the material and from the environment on adhesive behavior is addressed. The various surface events that alter adhesion, friction, and wear are discussed. These include surface reconstruction, segregation, chemisorption, and compound formation. Examples of these events are presented. Minor nuances in the structure of the outermost layers of solids have a pronounced effect on tribological properties. The importance of characterizing the materials of solids in contact in order to achieve a fundamental understanding of adhesion, friction, and wear and accordingly of methods for their control are addressed. Author

N84-23894*# Ecole Centrale de Lyon (France). Lab. de Technologie des Surfaces.
NATURE OF THE SURFACE AND ITS EFFECT ON SOLID-STATE INTERACTIONS c76

J. M. Georges *In* NASA Lewis Research Center Tribology in the 80's. Vol. 1 Apr. 1984 p 45-63 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01 CSCL 20L

An important aspect of the friction and wear of solids is the nature and the mechanical behavior of the surface films. A description of the mechanical, physical, and chemical behavior of surface films is achieved by an investigation of boundary lubrication. Two major points are demonstrated. First, the sliding of two solid surfaces under boundary lubricating conditions creates third bodies in the interface. Second, the nature and the evolution of the interface are dictated by the colloidal behavior of the products generated. To illustrate these two propositions, some recent work is presented. Author

N84-23895*# Federal Inst. for Materials Testing, Berlin (West Germany).
IMPORTANCE OF PROPERTIES OF SOLIDS TO FRICTION AND WEAR BEHAVIOUR
Horst Czichos *In* NASA Lewis Research Center Tribology in the 80's. Vol. 1 Apr. 1984 p 71-106 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01 CSCL 11H

The main properties of solids which influence friction and wear are discussed and published rules which relate material properties to friction and wear are considered. In addition, recent experimental results on the tribological behaviour of metals and polymers illustrating the effect of some important interaction characteristics on friction and wear are presented. Finally, a framework for the systematic compilation and documentation of relevant tribological parameters in experimental friction and wear investigations is given. Author

N84-23896*# Cambridge Univ. (England).
FUTURE DIRECTIONS OF RESEARCH IN ADHESION AND FRICTION. STATUS OF UNDERSTANDING
David Tabor *In* NASA Lewis Research Center Tribology in the 80's. Vol. 1 Apr. 1984 p 119-139 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01 CSCL 11H

Four main classes of materials are covered: metals, ceramics, elastomers and polymers. In dealing with adhesion a distinction is drawn between adhesion (which often involves thermodynamic concepts) and the observed adhesive strength, here designated as the pull-off force. With metals the level of understanding of the interfacial bond is well understood theoretically and was elegantly studied experimentally. However the role of surface roughness and especially ductility needs to be incorporated into an overall view of metallic adhesion. The effect of contaminant films has not gone far beyond purely descriptive language. The friction of metals is understood in terms of surface topography, adhesion and deformation and there are now promising solutions using slipline-field theory. These do not however, cope very satisfactorily with work hardening. For surfaces sliding at higher speeds there are now good models which deal with asperity instabilities produced by frictional heating. Author

N84-23897*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
METALLIC ADHESION AND BONDING **c26**
John Ferrante, John R. Smith (General Motors Research Labs.), and James H. Rose (Ames Lab.) *In its* Tribology in the 80's. Vol. 1 Apr. 1984 p 143-162 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01 CSCL 11F

Although metallic adhesion has played a central part in much tribological speculation, few quantitative theoretical calculations are available. This is in part because of the difficulties involved in such calculations and in part because the theoretical physics community is not particularly involved with tribology. The calculations currently involved in metallic adhesion are summarized and shown that these can be generalized into a scaled universal relationship. Relationships exist to other types of covalent bonding, such as cohesive, chemisorptive, and molecular bonding. A simple relationship between surface energy and cohesive energy is offered. Author

N84-23898*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE STRENGTH OF THE METAL. ALUMINUM OXIDE INTERFACE **c26**
Stephen V. Pepper *In its* Tribology in the 80's. Vol. 1 Apr. 1984 p 165-175 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01 CSCL 11F

The strength of the interface between metals and aluminum oxide is an important factor in the successful operation of devices found throughout modern technology. One finds the interface in machine tools, jet engines, and microelectronic integrated circuits. The strength of the interface, however, should be strong or weak depending on the application. The diverse technological demands have led to some general ideas concerning the origin of the interfacial strength, and have stimulated fundamental research on the problem. Present status of our understanding of the source of the strength of the metal - aluminum oxide interface in terms of interatomic bonds are reviewed. Some future directions for research are suggested. Author

N84-23899*# Virginia Polytechnic Inst. and State Univ., Blacksburg.
THE INFLUENCE OF SURFACE TOPOGRAPHY ON POLYMER FRICTION **c27**
Norman S. Eiss, Jr. *In* NASA Lewis Research Center Tribology in the 80's. Vol. 1 Apr. 1984 p 177-186 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01 CSCL 11G

Current friction models for polymers are examined to determine their applicability in predicting the effects of roughness on friction. The two component, adhesion deformation model of friction predicts the variation of friction with the change in the sliding direction with respect to the lay direction on anisotropic rough surfaces. The two component model does not predict the change in friction with changes in roughness. A combination of an energy based model and a slip line deformation model may provide a friction model which could better represent measured friction. Author

N84-23900*# Tokyo Inst. of Tech. (Japan).
FUTURE DIRECTION OF RESEARCH IN WEAR AND WEAR RESISTANT MATERIALS. STATUS OF UNDERSTANDING **c27**
T. Sasada *In* NASA Lewis Research Center Tribology in the 80's. Vol. 1 Apr. 1984 p 197-218 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01 CSCL 11G

The adhesion of materials is one of the most popular interactions occuring between mating solid surfaces in contact, and was regarded as a key factor in wear process. However, because the adhesion is not a separation factor but a joining factor for mating materials, it is not easy to show a general plot of the formation process of wear particle through adhesion. A new idea on the mechanism of formation of wear particles in adhesive wear is shown. The wear particles are not separated from their mother surfaces directly as their final form, but minute adhered fragments are assembled and piled up to form a big particle which should be called as a wear particle after it is removed out of the rubbing system. From this proposed mechanism many other phenomena related to wear are interpreted. Author

N84-23901*# Battelle Columbus Labs., Ohio.
MICROSTRUCTURES ASSOCIATED WITH WEAR **c26**
W. A. Glaeser *In* NASA Lewis Research Center Tribology in the 80's. Vol. 1 Apr. 1984 p 219-235 refs (For primary document see N84-23891 14-37)
(Contract N00014-82-6-0255)
Avail: NTIS HC A22/MF A01 CSCL 11F

High strain associated with metal wear is discussed and

macroscopic and fine microscopic aspects are included. Mechanisms for the production of debris which include extrusion of microfurrows, adhesive transfer, and fragmentation are outlined. The structure of near surface deformation zones, a thin transfer layer, is examined. The similarity among the size of fine wear debris particles, the structure of the transfer layer, and large wear flakes is shown. Differences in microstructure associated with dry wear and lubricated wear are pointed out. Some parallels and differences for classic high strain deformation and wear microstructures are discussed. E.A.K.

N84-23902*# Kanazawa Univ. (Japan).
STRUCTURES AND PROPERTIES OF POLYMERS IMPORTANT TO THEIR WEAR BEHAVIOR **c27**
Kyuichiro Tanaka *In* NASA Lewis Research Center Tribology in the 80's. Vol. 1 Apr. 1984 p 253-285 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01

The wear and transfer of various semicrystalline polymers sliding against smooth steel or glass surfaces were examined. The effects of structures, and properties of polymers on their wear behavior are discussed. It is found that the high wear characteristics of PTFE is due to the easy destruction of the banded structure of PTFE. The size of spherulites and the molecular profile are closely related to the magnitude of wear rates of typical semicrystalline polymers. The effects of these factors on the wear rate on the basis of the destruction or melting of spherulites at the frictional surface are discussed. Although the fatigue theory of wear indicates that some mechanical properties are important to wear behavior, it is shown that the theory does not always explain the experimental result obtained on a smooth surface. E.A.K.

N84-23903*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CONSIDERATIONS IN FRICTION AND WEAR
Kazuhisa Miyoshi and Donald H. Buckley *In its* Tribology in the 80's. Vol. 1 Apr. 1984 p 291-320 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01 CSCL 11H

The abrasion of ceramic materials is discussed. The friction and wear properties of ceramics which arise primarily from adhesion between sliding surfaces in contact was examined. The role of chemical bonding in adhesion and friction and the influence of surface films, temperature, and crystallographic orientation effects on tribological response with respect to adhesion, friction, and wear are discussed. The complex interaction of various deformation and fracture mechanisms in ceramics, the effect of crystallographic orientation on abrasion, friction, and fracture behavior is addressed. E.A.K.

N84-23904*# Royal Aircraft Establishment, Farnborough (England).
COMPOSITES FOR INCREASED WEAR RESISTANCE: CURRENT ACHIEVEMENTS AND FUTURE PROSPECTS **c24**
J. K. Lancaster *In* NASA Lewis Research Center Tribology in the 80's. Vol. 1 Apr. 1984 p 333-356 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01 CSCL 11D

The various ways in which reductions in wear and/or friction can be achieved by the use of composite materials are reviewed. Reinforced plastics are emphasized and it is shown that fillers and fibers reduce wear via several mechanisms additional to their role of increasing overall mechanical strength, preferential transfer, counter face abrasion, preferential load support, or third-body formation on either the composite or its counterface. Examples are given from recent work on thin layer composites of the type widely used as dry bearings in aircraft flight control mechanisms. Developments in metal based composites and carbon-carbon composites for high energy brakes are discussed. The aspects which could benefit by increased fundamental understanding identified and the types of composites which appear to have greatest potential for further growth are indicated. E.A.K.

N84-23905*# Pennsylvania State Univ., University Park.
STATUS OF NEW DIRECTION OF LIQUID LUBRICANTS **c27**
E. E. Klaus *In* NASA Lewis Research Center Tribology in the 80's. Vol. 1 Apr. 1984 p 367-389 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01 CSCL 11H

The status of liquid lubricants is discussed. Liquid lubricants which continue to be the predominant form of lubrication for machinery are discussed. Petroleum base lubricants comprise a very high percentage of the liquid lubricants in use today. There is a significant movement toward synthetic lubricants driven by crude oil problems coupled with improved additive response, and low temperature performance for the synthetics. Lubricant degradation mechanisms are included for guidance in the selection of lubricant and additive types. Author

N84-23906*# Phillips Petroleum Co., Bartlesville, Okla.
ANTIWEAR ADDITIVE MECHANISMS IN SLIDING CONTACTS
B. A. Baldwin *In* NASA Lewis Research Center Tribology in the 80's. Vol. 1 Apr. 1984 p 391-413 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01 CSCL 11H

The possible mechanisms associated with wear in a sliding contact and how an oil and antiwear additive can mitigate wear or prevent catastropic seizure of the contacting parts was examined. The various load and temperature regimes are examined and the mechanisms which are predominant under these conditions are determined. The critical mechanism(s) depend on the test parameters, particularly load and temperature, although sliding speed is also a factor. Different ways to improve the efficiency of antiwear additives are suggested. E.A.K.

N84-23907*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THERMAL AND OXIDATIVE STABILITIES OF LIQUID LUBRICANTS **c27**
William R. Jones, Jr. *In its* Tribology in the 80's. Vol. 1 Apr. 1984 p 419-455 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01 CSCL 11H

The fundamental processes which occur during the thermal and oxidation degradation of hydrocarbons is reviewed. Various classes of liquid lubricants such as mineral oils, esters, polyphenyl ethers, C-ethers, and fluorinated polyethers are emphasized. Techniques to determine thermal and oxidative stabilities of lubricants are discussed. The role of inhibitors and catalysis is examined. E.A.K.

N84-23908*# Tokyo Inst. of Tech. (Japan).
BEHAVIORS OF POLYMER ADDITIVES UNDER EHL AND INFLUENCES OF INTERACTIONS BETWEEN ADDITIVES ON FRICTION MODIFICATION **c27**
Toshio Sakurai *In* NASA Lewis Research Center Tribology in the 80's. Vol. 1 Apr. 1984 p 459-475 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01 CSCL 11H

Polymer additives have become requisite for the formulation of multigrade engine oils. The behavior of polymethacrylate (PMA)-thickened oils as lubricants in concentrated contacts under nominal rolling and pure sliding conditions was investigated by conventional optical interferometry. The PMA thickened oils behaved differently from the base oil in the formation of elastohydrodynamic (EHL) films. The higher the elastohydrodynamic molecular weight of the PMA contained in the lubricant, the thinner was the oil film under EHL conditions. The film thickness of shear-degraded PMA-thickened oils was also investigated. The behavior of graphite particles dispersed in both the base oil and the PMA-thickened oil was studied under pure sliding by taking photomicrographs. Many kinds of additives are contained in lubricating oil and the interactions between additives are considered. The interactions of zinc-organodithiophosphates (ZDP) with other additives is discussed. E.A.K.

N84-23909*# California Univ., San Diego.
WHAT'S SO HOT ABOUT FORMULATED SYNTHETICS? c27
Alan Beerbower *In* NASA Lewis Research Center Tribology in the 80's. Vol. 1 Apr. 1984 p 477-488 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01 CSCL 11H

The development of synthetic automotive engine oil is discussed. The history of synthetic lubricants, and of the additives required to compete in a market which developed by and for petroleum oils. Some examples of real data, and enlarged using heat transfer properties obtained by chemical engineering thermodynamic methods are shown. The prospects for future successes and ideas on the additives that would most help to bring them about are also presented. E.A.K.

N84-23910# Battelle Columbus Labs., Washington, D. C.
GUIDANCE AND ACTUATION SYSTEMS FOR AN ADAPTIVE-SUSPENSION VEHICLE Final Technical Report, 7 Mar. 1983 - 15 Mar. 1984
M. R. Patterson, J. J. Reidy, and R. C. Rudolph 14 Mar. 1984 126 p
(Contract DAAE07-83-C-R040; DARPA Order 4670)
(AD-A139111; BATT-G8186-685-84) Avail: NTIS HC A07/MF A01 CSCL 13/6

The Battelee project consisted of two major tasks. The first task's objective was to develop a computer system that would generate vehicle trajectories and leg motion sequences that would enable the adaptive-suspension vehicle to move over rough terrain along a path specified by a human operator. The second task involved the design, fabrication and testing of a safety valve for the foot-lift circuit of the vehicle's leg. GRA

N84-23911# General Power Corp., Paoli, Pa.
WAVE ENGINE TECHNOLOGY DEVELOPMENT Final Report, May - Sep. 1983
R. R. Coleman Wright-Patterson AFB, Ohio AFWAL Jan. 1984 15 p
(AD-A139175; AFWAL-TR-83-2095) Avail: NTIS HC A02/MF A01 CSCL 21/1

Self sustaining operation of the GPC Wave Engine Demonstration Unit (DU) was obtained in the range of 6500 to 8000 rpm using wave rotors with nozzle-to-chamber area ratios of .44 and .50. One test data run is compared in detail with the corresponding data from the GPC Wave Engine Simulation Program. Seal development during the contract period resulted in the design and preliminary test of a self-servoed face seal for the high pressure air port of the DU. Also, mechanically attached radial strip seals of inhibited graphite proved to be very effective in controlling angular leadage within the wave rotor cavity. GRA

N84-23912# Technical Research Centre of Finland, Espoo. Metallab.
HYDRAULIC CYLINDER SEALS IN ARCTIC CONDITIONS
Seppo Mikkonen Aug. 1983 48 p refs In FINNISH; ENGLISH summary Sponsored by Finnish Ministry of Trade and Industry (VTT-207; ISBN-951-38-1804-7; ISSN-0358-5077) Avail: NTIS HC A03/MF A01; Technical Research Centre of Finland, Espoo FIM 25

Piston seals were tested at minus 50 C in a test rig. Seals produced for normal temperatures leak. Seals produced for cold conditions work well in light use. Polyurethanes, nitrile compounds, and leather are suitable. Silicone and fluorosilicone rubbers are especially useful at low temperatures, but they are suitable only for static sealing because of wear. U-seals made of PTFE-compound with a metal spring behave well. Elastic seal materials were tested by durometer hardness (minus 60 to +60 C), compression set, temperature retraction, oil resistance and crystallization tests. Epichlorohydrin behaves satisfactorily.
Author (ESA)

N84-23913# Joint Publications Research Service, Arlington, Va.
USSR REPORT: MACHINE TOOLS AND METALWORKING EQUIPMENT
25 Apr. 1984 46 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UMM-84-008) Avail: NTIS HC A04/MF A01

Progress in machine tools and metalworking equipment development is reported. Topics discussed include: industry planning and economics, automated assembly times and aggregated machining systems, and application of robotics to industry. For individual titles, see N84-23914 through N84-23916.

N84-23914# Joint Publications Research Service, Arlington, Va.
INDUSTRY URGED TO INCREASE OUTPUT OF NC MACHINE TOOL, ROBOTICS c54
In its USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-84-008) 25 Apr. 1984 p 6-7 Transl. into ENGLISH from Pravda (Moscow), 2 Feb. 1984 p 1 (For primary document see N84-23913 14-37)
Avail: NTIS HC A04/MF A01

Methods to increase the industrial production output of machine tools are outlined. Management planning and factory automation is discussed. Use of industrial robots with programmed control is suggested. E.A.K.

N84-23915# Joint Publications Research Service, Arlington, Va.
INDUSTRY OFFICIAL ON PROGRESS IN SOVIET ROBOTICS PROGRAM c54
M. Shkabardnya *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-84-008) 25 Apr. 1984 p 37-39 Transl. into ENGLISH from Pravda (Moscow), 7 Jan. 1984 p 2 (For primary document see N84-23913 14-37)
Avail: NTIS HC A04/MF A01

Robot building which is a new machine building subsector is examined. A program for the development and introduction of robot manipulator complexes and versatile automated production facilities is described. Automatic manipulators and robotics complexes are developed at machine building enterprises. Specific goals and development deadlines are given and second generation robots and also for "intellectual robots" which are capable of performing complex production operations with pattern recognition. Changes are introduced in the structure of production management. E.A.K.

N84-23916# Joint Publications Research Service, Arlington, Va.
USE OF ROBOTS IN ESTONIAN AUTO, MACHINE TOOL INDUSTRIES VIEWED c54
Oleg Jurogin *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-84-008) 25 Apr. 1984 p 40-42 Transl. into ENGLISH from Rahva Haal (Tallinn), 6 Mar. 1984 p 3 (For primary document see N84-23913 14-37)
Avail: NTIS HC A04/MF A01

The development of industrial robots and artificial intelligence is discussed. The benefits of robots to manufacturing methods are outlined. The further development of microprocessors for the use with robots, in the machine tool, construction, metallurgy, agriculture and hydrodynamics industry is described. E.A.K.

N84-23560# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Metallische Werkstoffe.
ECONOMIC RIVETING: DIFFERENT BORE QUALITIES, FITTINGS, CONNECTION ELEMENTS [WIRTSCHAFTLICHES NIETEN: UNTERSCHIEDLICHE BOHRUNGSQUELITATETEN, PASSUNGEN, VERBINDUNGSELEMENTE]
K. Hoffer *In its* Develop. and Demonstration of Econ. Production Systems in Airframe Construct., Part 2, Part 6 Nov. 1983 p 84-86 In GERMAN (For primary document see N84-23555 14-01)
Avail: NTIS HC A08/MF A01

N84-23561# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Metallishe Werkstoffe.
WELDING OF COMPONENTS MADE OF THE ALUMINUM CAST ALLOY A357 [SCHWEISSEN VON BAUTEILEN AUS DER AI-GUSSLEGIERUNG A357]
G. Meye *In its* Develop. and Demonstration of Econ. Production Systems in Airframe Construct., Part 2, Part 6 Nov. 1983 p 87-97

In GERMAN (For primary document see N84-23555 14-01)
Avail: NTIS HC A08/MF A01

N84-23562# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Metallische Werkstoffe.
SUPERPLASTIC TRANSFORMATION AND DIFFUSION WELDING OF TITANIUM ALLOYS [SUPERPLASTISCHES UMFORMEN DIFFUSIONSSCHWEISSEN VON TI-LEGIERUNGE]
W. Beck *In its* Develop. and Demonstration of Econ. Production Systems in Airframe Construct., Part 2, Part 6 Nov. 1983 p 98-123
In GERMAN (For primary document see N84-23555 14-01)
Avail: NTIS HC A08/MF A01

N84-23747 Technische Hochschule, Aachen (West Germany). Gemeinschaftslab. fuer Elektronenmikroskopie.
WEAR DAMAGE TO MATERIALS [WERKSTOFFSCHAEDEN DURCH VERSCHLEISS]
Michael Pohl *In* Deut. Ges. fuer Metallkunde e.V. Systematic Evaluation of Tech. Causes of Damage 1983 p 299-328 refs
In GERMAN (For primary document see N84-23734 14-26)
Avail: Issuing Activity

N84-23748 Allianz-Zentrum fuer Technik G.m.b.H., Ismaning (West Germany).
DAMAGE TO WELDING SEAMS [SCHAEDEN AN SCHWEISSNAEHTEN]
H.-J. Schueller *In* Deut. Ges. fuer Metallkunde e.V. Systematic Evaluation of Tech. Causes of Damage 1983 p 329-379 refs
In GERMAN (For primary document see N84-23734 14-26)
Avail: Issuing Activity

N84-24179# Iowa Univ., Iowa City. Coll. of Engineering.
VEHICLE DYNAMIC ANALYSIS WITH FLEXIBLE COMPONENTS
S. S. Kim, A. A. Shabana, and E. J. Haug *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 125-142 (For primary document see N84-24173 14-59)
(Contract DAAG29-82-K-0086)
(AD-P002939) Avail: NTIS HC A99/MF A01 CSCL 13/6

N84-24196# Army Armament Research and Development Command, Dover, N. J. Fire Control and Small Caliber Weapon Systems Lab.
A SIMPLE APPROACH FOR DETERMINATION OF BURSTING PRESSURE OF A THICK-WALLED CYLINDER
S. C. Chu *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 499-520 (For primary document see N84-24173 14-59)
(AD-P002956) Avail: NTIS HC A99/MF A01 CSCL 12/1

N84-24204# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Civil Engineering.
A NUMERICAL TECHNIQUE IN THE HYDRODYNAMIC THEORY OF FOIL BEARINGS
I. G. Tadjbakhsh, G. Ahmadi, and E. A. Saibel *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 659-677 Prepared in cooperation with Clarkson Coll., Potsdam, N.Y. (For primary document see N84-24173 14-59)
(AD-P002966) Avail: NTIS HC A99/MF A01 CSCL 12/1

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N84-23917# Massachusetts Univ., Amherst. Dept. of Electrical and Computer Engineering.
A STUDY OF ERROR DETECTION AND CORRECTION CODES Annual Scientific Report, 1 Feb. 1983 - 31 Jan. 1984
J. K. Wolf 31 Jan. 1984 6 p
(Grant AF-AFOSR-0061-82; AF Proj. 2304)
(AD-A139398; AFOSR-84-0171TR) Avail: NTIS HC A02/MF A01 CSCL 09/4

Research was continued on the study of error detecting and error correcting codes for achieving the reliable transmission or storage of information over a noisy communications channel or imperfect memory. Three specific research areas were investigated. These were: (1) The design and performance evaluation of error detecting codes; (2) Decoding strategies for redundant discrete Fourier transform codes and their applications to impulse noise cancellation; and (3) Coding and decoding of convolutional codes. Author (GRA)

N84-23918# Battelle Pacific Northwest Labs., Richland, Wash.
AN ACOUSTICAL IMAGING SYSTEM FOR THE INSPECTION OF SOLID ROCKET MOTORS Final Report, Jul. 1981 - Dec. 1983
L. J. Busse, H. D. Collins, J. L. Eick, R. P. Gribble, and P. D. Sperline Edwards AFB, Calif. Air Force Rocket Propulsion Lab. Jan. 1984 59 p
(Contract F04611-81-C-0028; AF Proj. 5730)
(AD-A139482; AFRPL-TR-84-002) Avail: NTIS HC A04/MF A01 CSCL 14/2

This report describes the development and operation of an acoustical imaging, nondestructive test system for the inspection of small rocket motors. This report is intended to document the accomplishments of the program, the theoretical background, and the operational characteristics of the inspection system. The major objective of this program was to develop an acoustical imaging, nondestructive testing system for small rocket motors (i.e., 13-20 cm diameter). This inspection system was to be capable of detecting two types of defects within these rocket motors: (1) internal defects of inner-bore cracks; and (2) separations or debond between the various layers making up the wall of the rocket motor. The system was shown to be capable of detecting all of the flaw types it was originally designed to detect: (1) case/liner debonds; (2) liner/propellant debonds; and (3) inner-bore cracks. Case/liner debonds are reliably detected using the chirp frequency debond test, and the other two flaws are evident using the low frequency transmission test. GRA

N84-23919# Institute for Defense Analyses, Alexandria, Va. Science and Technology Div.
NONDESTRUCTIVE EVALUATION TECHNOLOGY WORKING GROUP REPORT (IDA/OSD R AND M (INSTITUTE FOR DEFENSE ANALYSES/OFFICE OF THE SECRETARY OF DEFENSE RELIABILITY AND MAINTAINABILITY STUDY) Final Report, Jul. 1982 - Aug. 1983
G. Mayer Aug. 1983 471 p
(Contract MDA903-79-C-0018)
(AD-A139484; AD-E500625; IDA/HQ-83-25921; IDA-D-37) Avail: NTIS HC A20/MF A01 CSCL 14/2

This document records the activities and presents the findings of the Nondestructive Evaluation Technology Working Group part of the IDA/OSD Reliability and Maintainability Study, conducted during the period from July 1982 through August 1983. GRA

N84-23920# Technical Research Centre of Finland, Espoo. Metallab.
ULTRASONIC INSPECTION OF INTERNAL DEFECTS IN CASTINGS
Hans Barck Jul. 1983 66 p refs In FINNISH; ENGLISH summary
Sponsored by Nordic Fund for Technology and Industrial Development of the Ministry of Trade and Industry
(VTT-201; ISBN-951-88-1822-5; ISSN-0358-5077) Avail: NTIS HC A04/MF A01

Internal defects in low alloy cast steel, and spheroidal and flake graphite iron were inspected ultrasonically and radiographically. Heat treatment and probe frequency are found to affect test results. The probability of detecting flaws in steel castings ultrasonically varies from 17% to 83% for shrinkage, and from 33% to 83% for cracks. For spheroidal iron, the probabilities vary from 40% to 100% for shrinkage; from 67% to 100% for gas

bubbles; and from 80% to 100% for inclusions. For flake graphite iron, detection probabilities for cracks vary from 20% to 80%; from 67% to 100% for shrinkage; and 100% for inclusions.
Author (ESA)

N84-23737 Karlsruhe Univ. (West Germany). Inst. fuer Werkstoffunde 1.
MATERIALS INVESTIGATIONS [WERKSTOFFUNTERSUCHUNGEN]
Hermann Mueller *In* Deut. Ges. fuer Metallkunde e.V. Systematic Evaluation of Tech. Causes of Damage 1983 p 25-47 refs In GERMAN Original language document announced as A84-24429 (For primary document see N84-23734 14-26)
Avail: Issuing Activity

N84-23813# North American Air Defense Command, Peterson AFB, Colo. System Control Div.
RELIABILITY IN SPACE: PROGRAM MANAGER AND USER AWARENESS
Alice J. W. Anderson *In* AF Academy Proc. of the 1983 Symp. on Mil. Space Commun. and Operations 1983 p 33-35 refs (For primary document see N84-23809 14-32)
(AD-P002148) Avail: NTIS HC A07/MF A01 CSCL 05/1

N84-24158# Tokushima Bunri Univ. (Japan).
CYCLIC ST-AN CODES AND MODULAR ST DISTANCE
Yoshiteru Ohkura, Ryosaku Shimada (Tokushima Univ., Japan), and Toshiharu Masegawa (Kyoto Univ., Japan) *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 294-299 refs (For primary document see N84-24115 14-59)
(AD-P002367) Avail: NTIS HC A19/MF A01 CSCL 09/4

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N84-23921*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
CLFE2D: A GENERALIZED PLANE STRAIN FINITE ELEMENT PROGRAM LAMINATED COMPOSITES SUBJECT TO MECHANICAL AND HYGROTHERMAL LOADING Interim Report
M. B. Buczek (Atlantic Research Corp.), M. A. Gregory, and C. T. Herakovich Oct. 1983 37 p refs
(Contract NCC1-15)
(NASA-CR-173507; NAS 1.26:173507; VPI-E-84-40; IR-38) Avail: NTIS HC A03/MF A01 CSCL 20K

CLFE2D is a two dimensional generalized plane strain finite element code, using a linear, four node, general quadrilateral, isoparametric element. The program is developed to calculate the displacements, strains, stresses, and strain energy densities in a finite width composite laminate. CLFE2D offers any combination of the following load types: nodal displacements, nodal forces, uniform normal strain, or hygrothermal. The program allows the user to input one set of three dimensional orthotropic material properties. The user can then specify the angle of material principal orientation for each element in the mesh. Output includes displacements, stresses, strains and strain densities at points selected by the user. An option is also available to plot the underformed and deformed finite element meshes. Author

N84-23922*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ANALYTICAL RESULTS FOR POSTBUCKLING BEHAVIOR OF PLATES IN COMPRESSION AND SHEAR
Manuel Stein Mar. 1984 31 p refs Submitted for publication
(NASA-TM-85766; NAS 1.15:85766) Avail: NTIS HC A03/MF A01 CSCL 20K

The postbuckling behavior of long rectangular isotropic and orthotropic plates is determined. By assuming trigonometric functions in one direction, the nonlinear partial differential equations of von Karman large deflection plate theory are converted into nonlinear ordinary differential equations. The ordinary differential equations are solved numerically using an available boundary value problem solver which makes use of Newton's method. Results for longitudinal compression show different postbuckling behavior between isotropic and orthotropic plates. Results for shear show that change in inplane edge constraints can cause large change in postbuckling stiffness. M.A.C.

N84-23923*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
VIBRATION AND FLUTTER OF MISTUNED BLADED-DISK ASSEMBLIES
Krishna Rao V. Kaza and Robert E. Kielb 1984 17 p refs Presented at the 25th Struct., Struct. Dyn. and Mater. Conf., Palm Springs, Calif., 14-16 May 1984; sponsored by the AIAA, ASME, ASCE and AHS
(NASA-TM-83634; E-2074; NAS 1.15:83634; AIAA-84-0991) Avail: NTIS HC A02/MF A01 CSCL 20K

An analytical model for investigating vibration and flutter of mistuned bladed disk assemblies is presented. This model accounts for elastic, inertial and aerodynamic coupling between bending and torsional motions of each individual blade, elastic and inertial couplings between the blades and the disk, and aerodynamic coupling among the blades. The disk was modeled as a circular plate with constant thickness and each blade was represented by a twisted, slender, straight, nonuniform, elastic beam with a symmetric cross section. The elastic axis, inertia axis, and the tension axis were taken to be noncoincident and the structural warping of the section was explicitly considered. The blade aerodynamic loading in the subsonic and supersonic flow regimes was obtained from two-dimensional unsteady, cascade theories. All the possible standing wave modes of the disk and traveling wave modes of the blades were included. The equations of motion were derived by using the energy method in conjunction with the assumed mode shapes for the disk and the blades. Continuities of displacement and slope at the blade-disk junction were maintained. The equations were solved to investigate the effects of blade-disk coupling and blade frequency mistuning on vibration and flutter. Results showed that the flexibility of practical disks such as those used for current generation turbofans did not have a significant influence on either the tuned or mistuned flutter characteristics. However, the disk flexibility may have a strong influence on some of the system frequencies and on forced response. Author

N84-23924*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AN AEROELASTICIAN'S PERSPECTIVE OF WIND TUNNEL AND FLIGHT EXPERIENCES WITH ACTIVE CONTROL OF STRUCTURAL RESPONSE AND STABILITY
Perry W. Hanson Apr. 1984 78 p refs
(NASA-TM-85761; NAS 1.15:85761) Avail: NTIS HC A05/MF A01 CSCL 20K

Active controls technology is assessed based on a review of most of the wind-tunnel and flight tests and actual applications of active control concepts since the late sixties. The distinction is made between so-called "rigid-body" active control functions and those that involve significant modification of structural elastic response or stability. Both areas are reviewed although the focus is on the latter area. The basic goals and major results of the various studies or applications are summarized, and the anticipated use of active controls on current and near-future research and demonstration aircraft is discussed. Some of the "holes" remaining in the feasbility/benefits demonstration of active controls technology are examined. A.R.H.

N84-23925*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STRESS-INTENSITY FACTOR EQUATIONS FOR CRACKS IN THREE-DIMENSIONAL FINITE BODIES SUBJECTED TO TEN-

SION AND BENDING LOADS
J. C. Newman, Jr. and I. S. Raju (Vigyan Research Associates, Hampton, Va.) Apr. 1984 40 p refs
(NASA-TM-85793; NAS 1.26:85793) Avail: NTIS HC A03/MF A01 CSCL 20K

Stress intensity factor equations are presented for an embedded elliptical crack, a semielliptical surface crack, a quarter elliptical corner crack, a semielliptical surface crack along the bore of a circular hole, and a quarter elliptical corner crack at the edge of a circular hole in finite plates. The plates were subjected to either remote tension or bending loads. The stress intensity factors used to develop these equations were obtained from previous three dimensional finite element analyses of these crack configurations. The equations give stress intensity factors as a function of parametric angle, crack depth, crack length, plate thickness, and, where applicable, hole radius. The ratio of crack depth to plate thickness ranged from 0 to 1, the ratio of crack depth to crack length ranged from 0.2 to 2, and the ratio of hole radius to plate thickness ranged from 0.5 to 2. The effects of plate width on stress intensity variation along the crack front were also included. M.A.C.

N84-23926*# University of Southern California, Los Angeles. Dept. of Civil Engineering.
FINITE ELEMENT ANALYSIS OF WRINKLING MEMBRANES
Richard K. Miller, John M. Hedgepeth (Astro Research Corp.), Victor I. Weingarten, Prasanta Das, and Shahrzad Kahyai Apr. 1984 86 p refs
(Grant NAG1-235)
(NASA-CR-172325; NAS 1.26:172325; USC-CE-83-05) Avail: NTIS HC A05/MF A01 CSCL 20K

The development of a nonlinear numerical algorithm for the analysis of stresses and displacements in partly wrinkled flat membranes, and its implementation on the SAP VII finite-element code are described. A comparison of numerical results with exact solutions of two benchmark problems reveals excellent agreement, with good convergence of the required iterative procedure. An exact solution of a problem involving axisymmetric deformations of a partly wrinkled shallow curved membrane is also reported. Author

N84-23927# Portsmouth Polytechnic (England). Lab. for Mechanical Behaviour of Materials.
THE CONJOINT ACTION OF HIGH AND LOW CYCLE FATIGUE Final Report, Jan. - Dec. 1982
B. E. Powell and I. Henderson Nov. 1983 14052 p
(Grant AF-AFOSR-0077-82; AF Proj. 2420)
(AD-A139205; AFWAL-TR-83-4119) Avail: NTIS HC A04/MF A01 CSCL 20/11

Fatigue crack propagation rates in Ti-6Al-4V subjected to relatively high frequency low amplitude vibrations superimposed on higher amplitude low frequency major cycles are studied. It is concluded that the vibrations, or minor cycles, have negligible effect below their fatigue threshold value. Above this level the minor cycles will contribute to the total growth rate; their contribution, successfully predicted by the method of linear summation, is dependent on their relative number and size. In gas turbine and compressor discs and blades, components which experience large numbers of minor cycles per flight, the damage associated with active minor cycle is dominant. Consequently, the onset of minor cycle damage effectively determines the useful life of such components. Author (GRA)

N84-23928# Florida Univ., Gainesville. Dept. of Engineering Sciences.
DYNAMIC RESPONSE OF CONCRETE AND CONCRETE STRUCTURES Annual Report, 1 Dec. 1982 - 30 Nov. 1983
L. E. Malvern and C. A. Ross 26 Jan. 1984 50 p
(Contract F49620-83-K-0007; AF Proj. 2307)
(AD-A139294; AFOSR-84-0165TR; AR-1) Avail: NTIS HC A03/MF A01 CSCL 13/13

This report describes the first-year activity of a three-year research program whose objectives are to: (1) Develop a loading function for close proximity explosions, (2) Determine dynamic strength properties for selected types of concrete, and (3) Incorporate the strength properties so determined into a localized failure criterion for reinforced concrete, (4) Use a structural analysis elastic/plastic finite element computer program to determine localized response for a concrete/steel finite element mesh, and (5) Combine all of these into a simple structural analysis program to determine response of underground structures to localized impulsive loads. A new Kolsky Bar System (Split Hopkinson's Bar) is being built to test concrete specimens up to 3 inches in diameter. A pilot program testing 0.75-inch diameter specimens in an existing Kolsky Bay System has shown a linear dependence of the unconfined compressive strength of mortar on the strain rate at the maximum stress. The pilot program has been useful for guiding the design of the new larger system. GRA

N84-23929# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
STRESS DISTRIBUTION IN A CYLINDRICAL BAR SUBJECTED TO CYCLIC TORSIONAL LOADING Final Technical Report
P. C. T. Chen and H. C. Wu Jan. 1984 25 p Presented at the 1st Army Conf., Appl. Math. and Computing, Washington, D.C., 9-11 May 1983
(AD-A139413; ARLCB-TR-84001) Avail: NTIS HC A02/MF A01 CSCL 20/11

The modified version of the endochronic of plasticity is applied to the problem of a cylindrical bar subjected to cyclic fully-reversed torsional loading. The governing equations of integral form are derived for pure shear deformation. Analytical techniques are employed in the solution of these equations. A material with appreciable cyclic hardening behavior is studied. The shear stress-strain curve of such a material under a strain-controlled condition is presented for all cycles until a steady loop is reached. The stress distributions in a cylindrical bar at different stages of loading and unloading are calculated. Some numerical results are presented. Author (GRA)

N84-23930# Illinois Univ., Urbana. Dept. of Aeronautical and Astronautical Engineering.
FINITE ELEMENT MODEL FOR NONAXISYMMETRIC STRUCTURE WITH RATE DEPENDENT YIELD CONDITIONS Final Report
A. R. Zak Aberdeen Proving Ground, Md. Army Armament Research and Development Command Feb. 1984 78 p
(Contract DAAK11-82-C-0007)
(AD-A139530; ARBRL-CR-00524) Avail: NTIS HC A05/MF A01 CSCL 20/11

A previously derived model of rate-dependent plasticity is modified for use in a finite element stress analysis code. The code allows nearly axisymmetric bodies to be analyzed by a perturbation of the symmetric solution. It contains anisotropic yield conditions. The formulation of rate effect is added to the code and a test problem of a uniaxial tensile experiment is solved. Convergence to the exact solution is shown. Author (GRA)

N84-23931# California Univ., Berkeley.
SOLUTION TECHNIQUES IN FINITE ELEMENT ANALYSIS Report, Mar. 1982 - Jan. 1983
B. Nour-Omid, C. Rodrigues, and R. L. Taylor Port Hueneme, Calif. Naval Civil Engineering Lab. May 1983 32 p Revised
(Contract N62474-82-C-8277; DA Proj. R02-303)
(AD-A139552; NCEL-CR-83.027) Avail: NTIS HC A03/MF A01 CSCL 20/11

A desirable advantage of iterative methods is that they provide means of controlling the accuracy of the solution. In particular, when low levels of accuracy are required this can result in faster algorithms than the direct methods. The use of the conjugate gradient algorithm to solve the linearized system of equations is considered. A preconditioning matrix based on a splitting method is constructed. The outcome is an algorithm which results in substantial reduction in storage over direct methods. The above method is compared with its rivals on several quite different

problems in structural mechanics and favorable results were obtained. Author (GRA)

N84-23932# Sandia Labs., Albuquerque, N. Mex.
COMPARISON OF FINITE ELEMENT PREDICTIONS AND EXPERIMENTAL DATA FOR THE FORCED RESPONSE OF THE DOE 100 kW VERTICAL AXIS WIND TURBINE
Donald W. Lobitz and Willian N. Sullivan Feb. 1984 18 p refs
(Contract DE-AC04-76DP-00789)
(DE84-007977; SAND-82-2534) Avail: NTIS HC A02/MF A01

A specialized finite element capability was developed to predict dynamic structural response of the vertical axis wind turbine (VAWT). This finite element analysis technique is evaluated. Several types of experimental data taken from the DOE 100 kW rotor are compared with predictions. Data include parked rotor natural frequencies, very low wind centrifugal and gravitational load response, and vibratory response from wind loads covering the rotor operational spectrum. It is concluded that the analysis package is suitable for engineering design. Shortcomings observed in modeling accuracy are due primarily to inadequacies in blade aerodynamic load calculations. DOE

N84-23933# Clemson Univ., S.C. Dept. of Civil Engineering.
FINITE ELEMENT MODEL TO COMPUTE STRESSES IN COMPOSITE MASONRY DUE TO CREEP, SHRINKAGE AND TEMPERATURE
S. C. Anand, A. Gandhi, and R. H. Brown Aug. 1983 121 p refs
(Grant NSF CEE-80-26767)
(PB84-152578; R-55-83; R-3; NSF/CEE-83217) Avail: NTIS HC A06/MF A01 CSCL 13C

A two dimensional finite element model is developed to incorporate the effects of creep, moisture, and thermal strains in the wythes of composite masonry walls. A numerical technique is presented to apply joint load increments on a wall that are equivalent to the creep strains for a given time element. The proposed technique is shown to lead to stable solutions. A similar scheme is also used to compute strains and stresses due to thermal and moisture strains. It is found that substantial stress redistribution occurs in a composite wall due to creep and that the effects of thermal and moisture strains cannot be neglected. GRA

N84-23558# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Metallische Werkstoffe.
STATISTICAL AND VIBRATORY FATIGUE LIMIT CHARACTERISTICS OF ALUMINUM CAST ALLOYS [STATISCHE UND SCHWINGFESTIGKEITSKENNWERTE FUER ALGYSSLEGIERUNGEN]
H. Frommeyer *In its* Develop. and Demonstration of Econ. Production Systems in Airframe Construct., Part 2, Part 6 Nov. 1983 p 60-80 In GERMAN (For primary document see N84-23555 14-01)
Avail: NTIS HC A08/MF A01

N84-23735 Technische Univ., Brunswick (West Germany). Inst. fuer Werkstoffe.
PROCEDURE OF TREATING A CASE OF DAMAGE [VORGEHENSWEISE BEI DER BEARBEITUNG EINES SCHADENSFALLES]
Guenter Lange *In* Deut. Ges. fuer Metallkunde e.V. Systematic Evaluation of Tech. Causes of Damage 1983 p 7-14 refs In GERMAN Original language document announced as A84-24427 (For primary document see N84-23734 14-39)
Avail: Issuing Activity

N84-23736 Technische Univ., Brunswick (West Germany). Inst. fuer Werkstoffe.
CLASSIFICATION, CAUSES, AND CHARACTERISTICS OF FRACTURES [EINTEILUNG, URASCHEN UND KENNZEICHEN DER BRUECHE]
Guenter Lange *In* Deut. Ges. fuer Metallkunde e.V. Systematic Evaluation of Tech. Causes of Damage 1983 p 15-23 ref In GERMAN Original language document announced as 84A-24428 (For primary document see N84-23734 14-26)
Avail: Issuing Activity

N84-23741 Technische Univ., Brunswick (West Germany). Inst. fuer Werkstoffe.
MACROSCOPIC APPEARANCE OF VIBRATORY FRACTURES [MAKROSKOPISCHE ERSCHEINUNGSFORMEN DES SCHWINGBRUCHES]
Guenter Lange *In* Deut. Ges. fuer Metallkunde e.V. Systematic Evaluation of Tech. Causes of Damage 1983 p 125-154 refs In GERMAN (For primary document see N84-23734 14-26)
Avail: Issuing Activity

N84-23742 Karlsruhe Univ. (West Germany). Inst. fuer Zuverlaessigkeit und Schadenskunde im Maschinenbau.
MICROSCOPIC APPEARANCE OF VIBRATORY FRACTURES [MIKROSKOPISCHE ERSCHEINUNGSFORMEN DES SCHWINGBRUCHES]
Dietrich Munz *In* Deut. Ges. fuer Metallkunde e.V. Systematic Evaluation of Tech. Causes of Damage 1983 155-183 refs In GERMAN (For primary document see N84-23734 14-26)
Avail: Issuing Activity

N84-23749 Karlsruhe Univ. (West Germany). Inst. fuer Zuverlaessigkeit und Schadenskunde im Maschinenbau.
FRACTURE MECHANICS IN THE ANALYSIS OF DAMAGE [BRUCHMECHANIK IN DER SCHADENSANALYSE]
Dietrich Munz *In* Deut. Ges. fuer Metallkunde e.V. Systematic Evaluation of Tech. Causes of Damage 1983 p 377-401 refs In GERMAN Original language document announced as A84-24439 (For primary document see N84-23734 14-26)
Avail: Issuing Activity

N84-24183# Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Ballistic Research Lab.
THE INFLUENCE OF CUTOUTS ON TRANSIENT RESPONSE OF HEMISPHERICAL SHELLS
A. D. Gupta and H. L. Wisniewski *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 237-244 (For primary document see N84-24173 14-59)
(AD-P002943) Avail: NTIS HC A99/MF A01 CSCL 12/1

N84-24195# Army Materials and Mechanics Research Center, Watertown, Mass.
THREE DIMENSIONAL STRESS ANALYSIS OF AN ARTILLERY PROJECTILE JOINT
T. Y. Tsui, M. L. Chiesa, and M. L. Callabresi *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 487-497 (For primary document see N84-24173 14-59)
(AD-P002955) Avail: NTIS HC A99/MF A01 CSCL 12/1

N84-24197# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
STRESS DISTRIBUTION IN A CYLINDRICAL BAR SUBJECTED TO CYCLIC TORSIONAL LOADING
P. C. T. Chen and H. C. Wu *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 521-533 (For primary document see N84-24173 14-59)
(AD-P002957) Avail: NTIS HC A99/MF A01 CSCL 12/1

N84-24212# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
THERMAL AND TRANSFORMATION STRESSES IN HOLLOW TUBES DURING THE QUENCHING PROCESS
J. D. Vasilakis *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 817-849 (For primary document see N84-24173 14-59)
(AD-P002976) Avail: NTIS HC A99/MF A01 CSCL 11/6

N84-24213# Army Materials and Mechanics Research Center, Watertown, Mass.
FINITE ELEMENT ANALYSIS OF FABRICS WITH NONLINEAR STRESS-STRAIN LAWS

A. R. Johnson *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 851-870 (For primary document see N84-24173 14-59)
(AD-P002977) Avail: NTIS HC A99/MF A01 CSCL 11/5

42 GEOSCIENCES (GENERAL)

N84-23934# Geological Survey, Washington, D. C.
US GEOLOGICAL SURVEY POLAR RESEARCH SYMPOSIUM. ABSTRACTS WITH PROGRAM
1983 62 p refs Symp. held 12-14 Oct. 1983
(USGS-Circ-911) Avail: NTIS HC A04/MF A01; also available from SOD

Mapping, tectonic evaluation, and mineral resource exploration in the Antarctic and Arctic regions are discussed. Specific attention is given to the use of satellite date in these areas. For individual titles, see N84-23935 through N84-23973.

N84-23935# Geological Survey, Washington, D. C.
ANTARCTIC MAPPING AND INTERNATIONAL COORDINATION Abstract Only c43
Rupert B. Southard and William J. Kosco *In its* US Geological Survey Polar Res. Symp. 1983 p 1-2 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

In the early days of mapping in Antarctica the U.S. Navy VXE-6 squadron acquired trimetrogon aerial photographs over major map features. Ground control was established by surveyors from the U.S. Geological Survey. Trimetrogon photogrammetry was used to compile maps first in the Sentinel Mountains, Thurston Peninsula, Horlich Mountains, Executive Committee Range, and McMurdo Sound. Ninety 1:250,000-scale topographic maps have been compiled by USGS over the Transantarctic Mountains and Western Antarctica. Working through the SCAR nations involved in mapping, the Antarctic standard symbols and specifications have been developed for preparing these maps. An international agreement was reached in the early 60's on the basic horizontal and vertical datums to be used for mapping. Recently, agreement was reached to include the contribution to geodesy in this age of satellites, by changing the basic geodetic reference datum in Antarctica from the international Spheroid to the World Geodetic System. J.M.S.

N84-23936# Geological Survey, Washington, D. C.
CONFIGURATION OF EASTERN GONDWANALAND Abstract Only c43
Warren Hamilton *In its* US Geological Survey Polar Res. Symp. 1983 p 2-3 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

Reconstructions of Gondwanaland vary in some details but agree on placing the east side of India against Antarctica, and the west side of Australia against some other continental mass now in, or under, Asia. These fits, despite their wide acceptance, juxtapose unlike Indian and Antarctic Precambrian terrains, and leave the marine Paleozoic and Mesozoic Tethyan north margin of India dead-ended against Antarctica or southwest Australia. The conventional fits produce untenable juxtapositions and separations of Paleozoic and lower Mesozoic paleoclimatic and paleobiogeographic indicators. A modified reconstruction placing the east side of India against the west side of Australia satisfies constraints of ocean-floor ages and magnetic anomalies, accounts for known paleomagnetic pole positions, and matches continental geology and rifting histories. This fit, unlike the conventional one, leaves space for certain (seychelles Plateau; Precambrian exposed), probable (naturaliste Plateau and Broken Ridge), and possible (kerguelen Plateau) continental fragments now in the Indian Ocean. J.M.S.

N84-23937# Geological Survey, Washington, D. C.
MINERAL RESOURCES OF ANTARCTICA Abstract Only c43
Peter D. Rowley, P. L. Williams, and D. E. Pride (Ohio State Univ., Columbus) *In its* US Geological Survey Polar Res. Symp. 1983 p 3 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

Metallic and nonmetallic mineral occurrences are abundant in Antarctica. The most significant known deposits are of iron, copper, and coal. In the Precambrian shield of East Antarctica, for example, iron is present as banded iron-formation and as magnetite in veins, pods, and schist. The largest deposits of iron are in the Prince Charles Mountains, where bodies of banded iron-formation at least as thick as 400 m extend, mostly under the ice for at least 120 km. Widely scattered morainal boulders and outcrops of iron-rich rock suggest that undiscovered iron deposits are also distributed over many other parts of East Antarctica. Gondwana reconstructions suggest that many more mineral deposits occur in Antarctica. However, ice covers nearly 98 percent of the continent, and few of the bedrock areas have even been prospected or geologically, geophysically, or geochemically mapped in detail. J.M.S.

N84-23938# Geological Survey, Washington, D. C.
SPECULATIONS ON THE PETROLEUM RESOURCES OF ANTARCTICA Abstract Only c43
John C. Behrendt and Charles D. Masters *In its* US Geological Survey Polar Res. Symp. 1983 p 3-4 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

Information on potential petroleum resources in Antarctica is summarized as follows: (1) west Antarctica is probably the most prospective area of Antarctica because is likely contains large areas of unmetamorphosed sedimentary rock of post-rift age; (2) the only practical areas for possible exploitation, were petroleum to exist, are the continental margins; (3) the sparse geophysical data suggest that there is a thick section of sedimentary rock beneath the Ross and beneath the Weddell Sea continental shelves; (4) DSDP holes on the Ross Sea continental shelf indicate the presence of rocks from Oligocene to Pleistocene in age; (5) there is presently no direct information on the petroleum geology beneath Antarctic continental shelves relative to source and reservoir rocks; and (6) Programs of environmental research are necessary to study meteorological, glaciological, oceanographic, and geologic hazards encountered during exploration or exploitation. Research programs into the fragile ecosystems that might be affected by possible blowouts or oil spills would also be required. J.M.S.

N84-23939# Geological Survey, Washington, D. C.
PLANNED MARINE GEOPHYSICAL GEOLOGICAL SURVEYS OF THE WILKES LAND AND ROSS SEA MARGINS Abstract Only c46
Stephen L. Eittreim *In its* US Geological Survey Polar Res. Symp. 1983 p 4-5 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

Seismic surveys to define the basins and seismic stratigraphy of parts of the Antarctic margin south of Australia and New Zealand are discussed. These will include Gravity and gradiometer-magnetic data, sonobuoy refraction and 3.5 and 12 kHz echo sounding, seafloor sampling done for age determination, for physcial and geochemical properties of sediments, and for contained gases. Australia and New Zealand rifted away from Antarctica in the middle of the Cretaceous producing rift basins, some of which are hydrocarbonrich, such as the Gippsland basin north of Tasmania. DSDP drilling in the region shows that the early phases of opening were a time of deposition of euxinic clays and silts, reflecting restricted basin circulation and probable local anoxic bottom-water conditions. On the Ross Sea Shelf, seismic data and DSDP cores show sediment many kilometers thick in three north-trending basins, with interstitial gases suggesting a thermogenic source. Several significant marine-geologic questions are addressed on this ice-fringed passive continental margin. The Antarctic margin is a good place to study post-rift subsidence and structures related to the Gondwana breakup. How these fracture zones and the ridge proximity have influenced basin development are questions for study. J.M.S.

N84-23940# Geological Survey, Washington, D. C.
SATELLITE IMAGE ATLAS OF GLACIERS: THE POLAR REGIONS Abstract Only **c43**
Richard S. Williams, Jr. and Jane G. Ferrigno *In its* US Geological Survey Polar Res. Symp. 1983 p 5 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

The Atlas involves 55 glaciologists representing 30 United States, foreign, and international organizations in an effort to produce a benchmark study of the glacierized areas of Earth. LANDSAT images provide the common data base for locating, describing, and mapping: (1) the areal extent of the Antarctic and Greenland ice sheets and ice caps in Iceland, Svalbard, the Russian Arctic islands, and northern Canada; (2) the termini of most large valley glaciers; and (3) the termini of tidal outlet glaciers. A comparison of LANDSAT images with published maps of the Arctic and Antarctic reveals many discrpancies, including incorrect positions of glacier margins, inaccuracies in geographic locations of glaciers, coastlines, and offshore islands. LANDSAT images are used as base maps to plot regional glaciological, geological, and geophysical data up to scales of 1:250,000 for LANDSAT multispectral scanner (MSS) images and up to 1:100,000 for LANDSAT 3 return beam vidicon (RBV) and LANDSAT 4 thematic mapper (TM) images. LANDSAT images have been used, in a time-lapse fashion, to monitor advance or recession of glaciers, to measure the velocity of outlet glaciers, and to monitor fluctuations in proglacial lakes. Because of the brief season and logistical costs and mobility difficulties in polar areas, satellite data are increasingly used to monitor dynamic phenomena in these areas. The Satellite Image Atlas of Glaciers, is representative of the type of multinational cooperative research possible. J.M.S.

N84-23941# Geological Survey, Washington, D. C.
WIND, WAVES AND SWELL IN THE ANTARCTIC MARGINAL ICE ZONE BY SEASAT RADAR ALTIMETER Abstract Only **c47**
William J. Campbell and Nelly M. Mognard (Centre National d'Etudes Spatiales, Toulouse) *In its* US Geological Survey Polar Res. Symp. 1983 p 6 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

During the Austral winter of 1978, the SEASAT satellite acquired repetitive radar altimeter observations of the oceans surrounding Antarctica. Quasi-synoptic fields of ocean surface wind speed, significant wave height, and significant swell height were computed for the entire three months the satellite operated. The generation, migration, and attenuation of swell in the southern oceans were measured for the first time. Extensive areas of pronounced significant wave height and swell height were found to occur somewhere near the Antarctic marginal ice zone every few days during the winter 1978. During the period 7 to 9 October 1978, storms between Antarctica and Australia and in the eastern South Pacific with surface wind speeds as high as 20 m/s generated large areas with significant wave heights as large as 16 m and significant swell heights as large as 12 m. Extensive wave trains with significant wave height at large as 10 to 12 m and swell as large as 8 to 10 m were observed to impact large areas of the Antarctic marginal ice zone. It is shown that phenomena within the ice can be observed with the radar altimeter. J.M.S.

N84-23942# Geological Survey, Washington, D. C.
SURVEYING IN ANTARCTICA DURING THE INTERNATIONAL GEOPHYSICAL YEAR Abstract Only **c31**
William H. Chapman *In its* US Geological Survey Polar Res. Symp. 1983 p 6-7 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

The Antarctic International Geophysical Year (IGY) scientists discovered that the existing maps contained many errors, particularly where the original exploration was by aircraft. An expedition of two DC-3 aircraft was taken to the Ellsworth Station on the Weddell Sea. A test network of 10 control points was established 200 miles south of the Ellsworth Station on the Filchner Ice Shelf in the vicinity of the Pensacola Mountains. The Positions of these points were determined by solar altitude measurements made every hour for 24 hours. U.S. Geological Survey topographic engineers were to survey any mountain ranges by establishing positions by solar altitude measurement and elevations by barometric altimetry. Aerial photographs over major mountain ranges using P-2V aircraft equipped with trimetrogon cameras was combined with the control established by the surveyors at the U.S. Geological Survey, to produce 1:250,000-scale topographic maps. The first maps produced covered the Thurston Peninsula, Sentinel Mountains, Horlick Mountains, Executive Committee Range, and McMurdo Sound. J.M.S.

N84-23943# Geological Survey, Washington, D. C.
THE DUFFEK INTRUSION OF ANTARCTICA AND A SURVEY OF ITS MINOR METALS RELATED TO POSSIBLE RESOURCES **c43**
Arthur B. Ford *In its* US Geological Survey Polar Res. Symp. 1983 p 7-10 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

The Dufek intrusion is large differentiated layered mafic igneous complex of Jurassic age in the northern Pensacola Mountains mostly covered by ice. Geologic studies determined that nearly 2 km of a lower (not lowest) part of the body is exposed in the Dufek Massif and about 1.7 km of the Fe-enriched highest part is exposed in the Forrestal Range. The rocks are generally well-layered cumulates of predominantly gabbroic composition which contain cumulus plagioclase and two pyroxenes. A reconnaissance geochemical survey shows marked enrichment in Cu, V, Ti, Pt, Pd, and S in the upper (Forrestal Range) section and corresponding depletion in Cr and Ni. Petrologic comparisons with other complexes suggest that the major pyroxenitic members of the Dufek Massif section lie at a position analogous to a level about 2 km above the chief platinum-group-metal horizons of the pyroxenitic Merensky Reef of the Bushveld Complex. Platinum-group metals would be of chief resource interest, but the absence of placers and soils will make exploration difficult. Correlation studies suggest that V may be a useful pathfinder element in a geochemical exploration for the metals within exposed units; however, drilling would be needed to explore basal layers, where metals are most likely to occur. J.M.S.

N84-23944# Geological Survey, Washington, D. C.
CRYSTALLIZATION OF THE DUFFEK INTRUSION, ANTARCTICA Abstract Only **c46**
Glen R. Himmelberg and Arthur B. Ford *In its* US Geological Survey Polar Res. Symp. 1983 p 10-11 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

The layering, textures, and mineral chemistry variation with stratigraphic height make it clear that the dominant process in the formation of the Dufek intrusion was fractional crystallization with accumulation, or crystallization, from the base upward. The cyclic sequence of plagioclase cumulates grading upward to plagioclase-pyroxene cumulates suggests wither periodic convective overturn of magma or influx of more primative magma to the crystallization site. The major reversal in mineral fractionation trends near the top of the intrusion, which coincides with an angular discordance in layering dip, strongly indicates an influx of new magma at the site of crystallization. Reversal magnitudes suggest incursion of either less fractionated magma from some other part of the chamber or mixing of primative magma with Fe-rich residual magma. J.M.S.

N84-23945# Geological Survey, Washington, D. C.
GEOPHYSICAL INVESTIGATIONS OF THE DUFEK INTRUSION AND THE SURROUNDING REGION Abstract Only **c46**
John C. Behrendt *In* US Geological Survey Polar Res. Symp. 1983 p 11-12 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

Results of aeromagnetic, gravity, and seismic reflection measurements made over the Dufek layered mafic intrusion in the Pensacola Mountains area of Antarctica are discussed. A combined aeromagnetic and radio echo ice-sounding survey made

over the Dufek intrusion suggests a minimum area of about 50,000 km. Theoretical magnetic anomalies, computed rom models based on the subice topography fitted to the highest-amplitide observed magnetic anomalies indicate that the Dufek intrusion cooled through the Curie isotherm during one or more reversals of the Earth's magnetic field. Theoretical profiles fitted to the gravity data indicate either an abnormally thin crust on the West Antarctica side or a normal crust on the West Antarctica side and a steep steplike transition from West Antarctica to East Antarctica that suggests a fault extending from the crust-mantle boundary to near the surface. Gravity, magnetic, and seismic data suggest a thick section of low-velocity, low-density, nonmagnetic, presumably sedimentary rock beneath the ice northwest of the pensacola Mountains. A least-squares regression of the Bouguer anomalies compared with elevation in the Pensacola Mountains area suggests that the amplitude of the gravity anomaly associated with the Dufek intrusion is about 85 mgal, corresponding to about 8.8- to 6.2-km thickness for the intrusion, assuming reasonable density contrasts. J.M.S.

N84-23946# Geological Survey, Washington, D. C.
GEOLOGY OF THE NEPTUNE RANGE, ANTARCTICA Abstract Only **c46**
Willis H. Nelson and Paul L. Williams *In its* US Geological Survey Polar Res. Symp. 1983 p 12 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

Two superposed unconformities separate the rocks of the Neptune Range into three sequences. The oldest sequence, the Patuxent Formation of late precambrian age, consists of several thousand meters of argillaceous metasandstone slate, and minor amounts of conglomerate. The Nelson Limestone, and shale, siltstone, and fine-graned sandstone of the late Cambrian Wiens Formation, unconformably overlie the Patuxent Formation. Silicic volcaic rocks, mostly volcaniclastic, derived from center within the Neptune Range compose the Gambacorta Formation, including the Hawkes Rhyodacite Member. The Cambrian and older rocks were moderately to strongly deformed during the early Paleozoic Ross orogeny, later beveled by erosion, and are now overlain unconformably by weakly to locally strongly folded clastic rocks. The general trends of structues in the Neptune Range and in the Transantarctic Mountains, of which the Neptunes are a part, all generally paralled the Pacific-Atlantic edge of the Antarctic craton. J.M.S.

N84-23947# Geological Survey, Washington, D. C.
PROTEROZOIC TO MESOZOIC MOBILE-BELT GEOLOGY, PENSACOLA MOUNTAINS, ANTARCTICA Abstract Only **c46**
Dwight L. Schmidt *In its* US Geological Survey Polar Res. Symp. 1983 p 12-13 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

The Pensacola Mountains consist of four unconformable sequences of: (1) graywacke (oldest), (2) platform, (3) molasses, and (4) continental (youngest) deposits. The first sequence of Middle Proterozoic graywacke deposits (Patuxent Formation) consists of turbidite quartzbearing sandstone and slate and volcanic rocks. The second sequence consist of extensive platform deposits of Lower Cambrian archaeocyathidbearing limestone and Middle Cambrian trilobitebearing limestone (Nelson Limestone) that are overlain by shale (Wiens Formation), and silicic volcanic rocks (Gambacorta Formation) including rhyolitic ignimbrite of caldera origin. The third sequence, The pre-Devonian Neptune Group consists of of basal orogenic conglomerate and more than 1,500 m of quartz-sandstone molasse that resulted from the erosion of the early Paleozoic mountains of the Ross orogeny. The fourth sequence of continental deposits of the Beacon Supergroup consists of Devonian quartz sanstone (Dover Sandstone), Permian glacial tillite (Gale Mudstone), and Permian siltstone and shale (Pecora Formation) containing glossopterid-bearing coal beds. During Early and Middle Jurassic time, and Transantarctic continental rift extensionally split the East Antarctic craton from West Antarctica as Gondwanaland began to break up. The continental rifting was shortly followed, during Late Jurassic time, by more vigorous extension resulting from major transform faulting. J.M.S.

N84-23948# Geological Survey, Washington, D. C.
SEDIMENTOLOGY OF THE HORLICK FORMATION (LOWER DEVONIANS), OHIO RANGE, TRANSANTARCTIC MOUNTAINS Abstract Only **c46**
Lucy McCartan, Margaret A. Bradshaw (Canterbury Museum), and Graeme Ayers (Mount Cook National Park) *In its* US Geological Survey Polar Res. Symp. 1984 p 13-14 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

The Horlick Formation of Early Devonian age consists of 10 to 50 m of subhorizontal interbedded subarkosic sandstone and chloritic shale and mudstone. It is exosed only in the Ohio Range of the Transantarctic Mountains between the Ross Ice Shelf and Ronne Ice Shelf, at about lat. 85 deg S. and long. 110 deg. 117 deg W. The Horlick Formation nonconformably overlies granitic basement rocks and is overlain by glacial and periglacial rocks of Permian age. It contains marine fossils, bone fragments and phosphatic clasts in several thin beds especially near the base, and calcareous concretions and beds of limestone. Quartz and lesser amounts of muscovite and feldspar are the dominant minerals in the sandstones. All evidence indicates that the Horlick Formation is an eastward-trending, long, linear body that accumulated primarily in a shallow, marginal-marine environment. The source, as indicted by the mineralogy, was southward-sloping granitic terrane, similar to the underlying basement rocks. No marine correlative of the Horlick Formation is known from antarctica, but nonmarine beds that may be Lower Devonian are present in Victoria Land. Bradshaw correlates the Horlick Formation with a fossiliferous formation in southwestern New Zealand. J.M.S.

N84-23949# Geological Survey, Washington, D. C.
SMALL-SCALE MAGNETIC FEATURES OF THE POLAR REGIONS **c46**
Joseph C. Cain and Dave Ray Schmitz *In its* US Geological Survey Polar Res. Symp. 1983 p 14-15 refs (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

A 29th degree and order spherical harmonic model was created from the vector and scalar MAGSAT data taken over the period November 1979 June 1980. The field from the first 13 orders was subtracted from that computed by the total set of coefficients to simulate the trend removal commonly used by geophysicists in studying magnetic anomalies. The resulting differences were then contoured at the Earth's surface to produce maps of magnetic anomalies in the polar regions. The strongest anomaly noted in this representation is hat near the Alpha and Mendeleyev Ridges. The vertical (and total) intensity peak is near 95 nT at about 150 deg W. and 85 deg N. Greenland is covered by two positive cells, each about half the intensity of the north polar high, with one in the north and the other in the south. The strongest anomaly over Antarctica has a +65 nT maximum in total intensity (but negative in the vertical contours since the vector is reckoned positive downward), and centered over Wilkes Land. This feature is surrounded on the ocean side by a general negative pattern which also intrudes into the Ross Ice Shelf. There are strong negative cells over both East and West Antarctica separated by a weak positive near the geographic pole. A positive feature of comparable intensity is seen over Enderby Land. J.M.S.

N84-23950# Geological Survey, Washington, D. C.
PALEOMAGNETIC STUDIES IN ANTARCTICA Abstract Only **c46**
Richard L. Reynolds and Karl S. Kellogg *In* US Geological Survey Polar Res. Symp. 1983 p 15-16 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

The use of paleomagnetism to determine rotations and translations of crustal blocks has contributed to the understanding of the tectonic evolution of Antarctica. The units most thoroughly studied paleomagnetically in East Antarctica are the Lower Jurassic

Ferrar sills and Dufek instrusion of the Transantarctic Mountains. Virtual geomagnetic poles calculated from these intrusives cluster closely and yield a paleomagnetic pole at latitude 54 deg S., longitude 153 deg W. The corresponding paleolatitude requires about 35 deg of southward drift for cratonic East Antarctica since its separation from Africa in Middle to Late Jurassic time. Geologic relationships point to more complex late Mesozoic and Cenozoic tectonic history of West Antarctica than o East Antarctica, and they lead to speculation that West Antarctica consists of at least three distinct crustal segments or provinces having separate patterns of consolidation with the present continent. Paleomagnetic data have been obtained from each of the three provinces - the Antarctic Peninsula, the Ellsworth Mountains, and Marie Byrd Land. Author

N84-23951# Geological Survey, Washington, D. C.
MARS-ANALOG STUDIES IN WRIGHT AND VICTORIA VALLEYS, ANTARCTICA Abstract Only **c46**
E. C. Morris and H. E. Holt *In its* US Geological Survey Polar Res. Symp. 1983 p 17 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

During the 1971 to 1972 field season, 1,300 photographs were taken of various geologic features in Victoria and Wright Valleys for comparative analysis with the pictures expected to be returned from the Viking Mars Mission in 1976. The cold dry weathering environments of the ice-free valleys of Antarctica provide one of the best terrestrial analogs of surface conditions on the planet Mars. The features photographed in Wright and Victoria Valleys, such as frozen dunes, patterned ground, various rock weathering phenomena, ventifacts, felsenmeers, tors, and desert pavements, have proved to be valuable in understanding features seen in the Viking photographs. The features seen in the Viking pictures that are analogous to those photoraphed in Antarctica include: armored pavements, wind tails (erosional and depositional features that record wind direction), ventifacts, frost shattering, and patterned ground. J.M.S.

N84-23952# Geological Survey, Washington, D. C.
AN ISOTOPIC AND CHEMICAL STUDY OF LAKE VANDA AND DON JUAN POND, ANTARCTICA Abstract Only **c46**
Irving Friedman, Athol Rafter (Inst. for Nuclear Studies), and George I. Smith *In its* US Geological Survey Polar Res. Symp. 1983 p 17-18 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

Temperature measurements made in Lake Vanda and in the lake subbottom sediments show that the high temperatures in the lake are not due to geothermal heat flow, but are probably trapped solar energy. On the basis of Sr-87/86 ratios the salts in Lake Vanda can be derived by a mixture of 58% weathered rock plus 42% from sea water or precipitation. Loss of efflorescences high in sodium, potassium and magnesium by high winds can yield the salt compositions present in both Lake Vanda and Don Juan Pond. From isotopic data on deuterium, O-18, C-13, Sr-87/86, S-34 as well as from chemical data on Lake Vanda waters, interstitial brines contained in the subsurface sediment and C-14 dates a lake history is proposed. J.M.S.

N84-23953# Geological Survey, Washington, D. C.
CLIMATIC SIGNIFICANCE OF LACUSTRINE DEPOSITS AROUND LAKE VANDA AND DON JUAN POND, ANTARCTICA Abstract Only **c47**
George I. Smith and Irving Friedman *In its* US Geological Survey Polar Res. Symp. 1983 p 18 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

Geologic reconnaissance in the valleys surrounding Lake Vanda and Don Juan Pond in Wright Valley, Antarctica, was carried out over a period of several days during November 1973. The reconnaissance included observations and sampling of lacustrine sediments exposed around both lakes. The expanded lakes, seem to indicate a period, possibly only a few centuries long, 2,000 to 3,000 years ago, characterized by slightly-warmer-than-present summers; they raised the snowline, increased the volumes of ice that melted annually from the lower parts of the glaciers and ice-cored debris flows, and caused the glaciers to retreat and the lakes to expand. When the summers cooled and the snowline again lowered, little or no ice remained at the levels where summer melting could occur, and at first the lakes received almost no runoff and nearly desiccated. Eventually, however, the surplus ice accumulating above the new snowline would have been transported by glaciers far enough down into the valleys for summer melting to again produce sufficient runoff to nourish lakes of the sizes and levels presently found. J.M.S.

N84-23954# Geological Survey, Washington, D. C.
PROGRAM FOR MAPPING ANTARCTICA Abstract Only **c43**
Peter F. Bermel and Charles E. Morrison *In its* US Geological Survey Polar Res. Symp., Abstracts with Program 1983 p 18-19 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

The Antarctic cartographic effort undertaken at the U.S. Geological Survey (USGS) as part of the U.S. Antarctic Research Program (USARP) is described. The USGS has focused its mapping on West Antarctica and the Transantarctic Mountains to support the requirements of USARP. It has sent field parties to Antarctica every year since 1957 to establish geodetic control and has worked closely with U.S. Navy Squadron VXE-6 to acquire mapping-quality aerial photographs. The program has been very productive, resulting in over 90 1:250,000-scale topographic reconnaissance maps of West Antarctica and the Transantarctic Mountains. Other products include 1:50,000-scale topographic maps, 1:500,000-scale sketch maps, 1:1,000,000-scale topograpic maps and shaded-relief reconnaissance maps, as well as satellite image maps at several mapping scales. J.M.S.

N84-23955# Geological Survey, Washington, D. C.
THE USE OF SATELLITE TECHNOLOGY IN THE SEARCH FOR METEORITES IN ANTARCTIC
Abstract Only **c91**
Tony K. Meunier *In its* US Geological Survey Polar Res. Symp. 1983 p 19-20 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

Delineation of surficial blue-ice patches in Antarctica is possible with K LANDSAT spacecraft and the NOAA series of weather satellites. LANDSAT 1, 2, and 3 MSS have a pixel (picture element) size of about 80 m. The images are usually acquired in four spectral bands: MSS band 4, 0.5 to 0.6 cm; MSS band 5, 0.6 to 0.7 cm; MSS band 6, 0.7 to 0.8 cm; and MSS band 7, 0.8 to 1.1 cm. In the identification of blue ice areas, MSS bands 6 and 7 are similar, with band 7 somewhat better than MSS band 6. MSS band 5, however, is best in areas of bedrock exposure, because blue ice and rock outcrops usually have a similar spectral response. All the five blue-ice areas, selected from satellite images and aerial photographs for field investigation, were found to contain concentrations of meteorites. This was totally unexpected and highly significant. The use of satellite technology proved to be effective, and its continued use will be an important tool in the systematic search for and recovery of meteorites in Antarctica. J.M.S.

N84-23956# Geological Survey, Washington, D. C.
GLACOLOGICAL AND GEOLOGICAL STUDIES OF ANTARCTICA WITH SATELLITE REMOTE SENSING TECHNOLOGY Abstract Only **c48**
Jane G. Ferrigno, Richard S. Williams, Jr., C. Scott Southworth, and Tony K. Meunier *In its* US Geological Survey Polar Res. Symp. 1983 p 20-21 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

Remotely sensed data were used to support a variety of glaciologica and geologica investigations in Antarctica. A significant attribute of the LANDSAT image is that it contains the precise time of acquisition, providing a method for making time-lapse measurements of the dynamics of the coast of Antarctica. Two LANDSAT images, 1185-13530 and 2022-13582, respectively, were used to determine the velocity of the terminus of the Pine

Island Glacier, tidal outlet glacier on the Walgreen Coast, West Antarctica. LANDSAT images of the Amery Ice Shelf and terminus of the Lambert Glacier were combind as a 1:500,000-scale uncontrolled image mosaic to serve as a base for compilation of 1 and 5 m contours of the shelf derived from 45 SEASAT radar altimeter traverses. The successful experiment reemphasized the fact that satellite image mosaics and maps can be effectively used as the compilation base for various typs of geological, glaciological, and geophysical data. LANDSAT images of Antarctica were used to prepare 1:1,000,000 scale planimetric maps of coastal areas, bedrock exposures, and blue-ice areas of Antarctic. Digital processing of LANDSAT multispectral scanner (MSS) images of rock outcrops in Antarctica was used to map rock units from nunatak to nunatak on the basis of their spectral reflectance characteristics. J.M.S.

N84-23957# Geological Survey, Washington, D. C.
MODELING THE MOVEMENT AT THE POLAR ICE CAP AT THE SOUTH POLE Abstract Only **c43**
Thomas Henderson *In its* US Geological Survey Polar Res. Symp. 1983 p 21 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

Winter-over teams at the South Pole provided continual geodetic satellite tracking. The coordinates computed from satellite data represent a significant improvement in both accuracy and precision over astronomic positions. By analyzing the Doppler frequency shift curves received from passing satellites, ground points are resolved to within 1 m of their true coordinates. Coordinates are provided in a geocentric X-Y-Z reference system, so the data are immediately usable in rectangular plots. Compensation is made for the slight wobble in the Earth's polar axis when reducing to the geocentric system to eliminate this source of comparison difference. Again, linear least squares fits were made to the plots of X versus time and Y versus time. The resulting three models fit the data with a standard deviation of 0.9 m in both X and Y. They indicate a movement of 10 m per year. J.M.S.

N84-23958# Geological Survey, Washington, D. C.
TECTONIC EVOLUTION OF THE ARCTIC CONTINENTAL MARGIN IN THE BEAUFORT AND CHUKCHI SEAS: EVIDENCE FROM SEISMIC REFLECTIONS Abstract Only **c46**
Arthur Grantz and S. D. May *In its* US Geological Survey Polar Res. Symp. 1983 p 23 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

Multichannel seismic-reflection profiles in the northern Chukchi and Beaufort Seas suggest that three pulses of rifting created the first-order geologic structures and localized the sedimentary basins of the continental margin north of Alaska. A Late Triassic-Early Jurassic pulse isolated shelf deposits of the Mississippian to Triassic Arctic Alaska Basin from their sourceland in the present area of the Arctic Ocean and created the eastwestly trending Dinkum graben. This graben, which underlies the eastern half of the Alaskan Beaufort shelf, contains 2 to 4 km of inferred Jurassic to Paleogene clastic rocks. Late Neocomian to Albian rifting completed the process of continental breakup and formed the Canada Basin of the Arctic Ocean by sea-floor spreading. Both late Neocomian(?) and latest Cretaceous or early Paleogene pulses rifting between Wrangell Island and the Chukchi Continental Borderland appear to have thinned the continental crust into which the North Chukchi Basin subsided. Author

N84-23959# Geological Survey, Washington, D. C.
THE ARCTIC PLATFORM IN THE NATIONAL PETROLEUM RESERVE IN ALASKA: DEPOSITION, DEFORMATION AND PETROLEUM POTENTIAL **c46**
C. E. Kirschner *In its* US Geological Survey Polar Res. Symp. 1983 p 24-27 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

The National Petroleum Reserve in Alaska (NPRA) covers an area of 93,240 square km or about half of the Arctic slope in the west-central part of northern Alaska. The major elements of the geology and a few aspects of the stratigrahic history and structural development of the Arctic platform that have a significant bearing on the oil and gas potential of the region are outlined. The Arctic platform was originally defined as a pre-Albian tectonic feature that occupied the northern part of the present coastal plain and the adjacent area of the Arctic Ocean. The area of the platform is viewed as extending southward in the subsurface across the NPRA at least to the north front of the Brooks Range. Author

N84-23960# Geological Survey, Washington, D. C.
OIL AND GAS RESOURCES OF THE NORTH SLOPE, ALASKA **c43**
Kenneth J. Bird *In its* US Geological Survey Polar Res. Symp. 1983 p 27-30 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

After 40 years of oil and as exploration by Government and industry, the North Slope is now known to contain resources of both conventional and unconventional oil and gas. Conventional oil is currently the only economic resource, but an important one that contributes one-fifth of daily U.S. production. Unconventional oil resources include heavy oil, tar, and oil shale; unconventional gas resources include tight-gas sand, gas hydrates, coalbed methane, and geopressured methane. The current understanding of these resources is based on two Government exploration programs, combined with information from U.S. Geological Survey (USGS) onshore and offshore studies, the literature, and industry drilling results. Author

N84-23961# Geological Survey, Washington, D. C.
PETROLEUM SOURCE ROCK RICHNESS, TYPE AND MATURITY FOR FOUR ROCK UNITS ON THE ALASKAN NORTH SLOPE: ARE THEY SOURCES FOR THE TWO OIL TYPES? Abstract Only **c43**
Leslie B. Magoon and George E. Claypool *In its* US Geological Survey Polar Res. Symp. 1983 p 30-31 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

A comprehensive petroleum geochemical study assessed the petroleum resources on the Alaskan North Slope. The collection and interpretation of geochemical data not only from exploratory wells drilled in the National Petroleum Reserve in Alaska (NPRA) but also from wells drilled to the east in the Prudhoe Bay area and from rocks exposed in the Arctic National Wildlife Refuge and in the Brooks Range from Cape Lisburne to the United States/Canadian border were studied. More than 17 different kinds of rock analyses, eight different oil analyses, and three gas analyses are being used to evaluate rock (outcrop samples, core, drill cuttings), oil (seeps, drill stem test, oil-stained core, producing well), and gas (drill stem test, producing well) samples on the North Slope. To date, the more than 60,000 analyses completed on these samples were placed into a computer-based file for storage and retrieval in tabular, graphical, or map form; numerous graphical software programs were written to facilitate interpretation. Author

N84-23962# Geological Survey, Washington, D. C.
EMERGING RECOGNITION OF THE NONFUEL MINERAL RESOURCES OF ARCTIC ALASKA Abstract Only **c43**
Donald Grybeck *In its* US Geological Survey Polar Res. Symp. 1983 p 31-32 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

Some of the most exciting new mineral discoveries in Alaska during the past two decades were in the Brooks Range, yet conventional wisdom 25 years ago was that northern Alaska was rather unpromising, if not geologically unfavorable for mineral deposits. Nonetheless, what has emerged in the Brooks Range is a mineral frontier, largely as a result of detaild geologic mapping, systematic mineral exploration, better accessibility, and new ore-deposit models. Author

N84-23963# Geological Survey, Washington, D. C.
COAL OCCURRENCE, QUALITY AND RESOURCE ASSESSMENT, NATIONAL PETROLEUM RESERVE IN ALASKA **c43**
Gary D. Stricker *In its* US Geological Survey Polar Res. Symp.

1983 p 32-33 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

Field studies of the Cretaceous Torok, Kukpowruk, and Corwin Formations in the western portion of the NPRA (National Petroleum Reserve in Alaska) and Cretaceos Torok, Tuktu, Grandstand, and Chandler Formations in the eastern portion of NPRA indicate that two major delta systems are responsible for most of the coal accumulation in this area. The Corwin delta in the western portion was an early Albian to Cenomanian, north and east prograding system, whereas the slightly younger mid-Albian to Cenomanian Umiat delta system prograded north and northeast in the eastern portion. Investigations of the lightologies, fossils, and primary depositional structures of these formations indicate that the Corwin system was deposited as a large, high-constructional, shaped delta on which thick and numerous coals developed on splay and interdistributary bay platforms away from the influence of the Cretaceous epicontinental sea. The Umiat delta started out as a high-constructional system but in time became wave dominated, and its shape changed to lobate. Author

N84-23964# Geological Survey, Washington, D. C.
PERMAFROST AND THE GEOTHERMAL REGIME Abstract Only **c46**
Arthur H. Lachenbruch and B. V. Marshall *In its* US Geological Survey Polar Res. Symp. 1983 p 33-34 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

Permafrost is the region in the solid earth where the temperature is below 0 C summer and winter. Within this region, water usually occurs as ice, often in massive segregated forms, although capillary water, brines, and gas hydrates also occur. The frozen condition renders permafrost impermeable to water flow, subject to brittle fracture under seasonally induced thermal stress, and subject to mechanical failure and flow when thawed by natural processes or disturbed by man. Hence an understanding of the factors controlling the geothermal regime is necessary for an understanding of geomorphic processes and for successful design of engineering structures such as roadways, heated buildings, pipelines, and oil wells in permafrost terrains. Studies of these factors are greatly simplified by the general absence of heat transfer by flowing ground water; temperatures are estimated with confidence from heat-conduction theory if the ground surface temperature, regional heat flow, and thermal properties are known. Author

N84-23965# Geological Survey, Washington, D. C.
GLACIATION IN ARCTIC ALASKA Abstract Only **c46**
Thomas D. Hamilton *In its* US Geological Survey Polar Res. Symp. 1983 p 34-36 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

The glacial record of arctic Alaska includes advances of late Tertiary age, a complex sequence of Pleistocene fluctuations, and minor expansions of cirque glaciers during the Holocene. Glaciers originated mainly within the Brooks Range, a 150-km-wide mountain chain that extends across northern Alaska. The range evidently supported extensive ice caps during late Tertiary and early Pleistocene glaciations, because erratics of Brooks range provenance indicate that large ice streams and piedmont glaciers fed from alpine sources extended far to the north across the Arctic Slope. Glaciers of middle and late Pleistocene age were successively less extensive; they were mainly confined to mountain valleys and flowed only short distances beyond the north flank of the range. A second ice source, probably in the Canadian Arctic, was responsible for ice-rafted erratics in late Cenozoic marine deposits along the Arctic coast east of Barrow. A third ice source is indicated by erratics of unknown provenance in Tertiary(?) gravel near the Colville River delta. Author

N84-23966# Geological Survey, Washington, D. C.
A PLEISTOCENE SAND DESERT IN ARCTIC ALASKA Abstract Only **c46**
L. David Carter *In its* US Geological Survey Polar Res. Symp. 1983 p 36 refs (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

A sand desert composed of large dunes and barren sand plains extended across a significant part of Arctic Alaska north of the Brooks Range during late Pleistocene time. The dunes occupied about 11,600 square km. of the Arctic Coastal Plain west of the Colville River, and the sand plains extended at least 100 km northeast of the dunes. This sand desert was part of an eolian system that extended about 400 km from sediment sources on outwash plains and fans in the east to where waning winds deposited loess along the margin of the Arctic Foothills southwest of the dunes. Linear dunes, as much as 20 km long and 1 km wide make up the eastern 7,000 square km of the dune field, but dune types in the rest of the area were not yet classified. All the Pleistocene dunes are obscured by a thin cover of younger eolian sand that includes small stabilized longitudinal and parabolic dunes. Author

N84-23967# Geological Survey, Washington, D. C.
SEDIMENTARY FACIES ON AN ICE DOMINATED SHELF, BEAUFORT SEA, ALASKA Abstract Only **c46**
Peter W. Barnes and Erik Reimnitz *In its* US Geological Suvey Polar Res. Symp. 1983 p 37 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

Sea ice is a major factor influencing the character of high latitude shelf deposits today and was throughout the Quanternary. Ice impacts sedimentation by physically disrupting the sea floor, by influencing wave and current regimes, by rafting sediments to depocenters and by affecting the erodability of seabed materials. As a result of this interaction distinctive facies are developed in the surficial sediments. The ice environments affecting the shelf stratigraphy is divided into the three zones. Inshore of about 20 m is the semistationary fast-ice, which is inundated with flood waters near rivers in the spring. Between about 20 m and 40 m a zone of grounded ice ridges composed of seasonal and multiyear ice (called stamukhi) is present during the winter and often lasts into the summer months. Author

N84-23968# Geological Survey, Washington, D. C.
QUATERNARY SEDIMENTATION ON THE ALASKAN BEAUFORT SHELF: SEDIMENT SOURCES, GLACIOEUSTATISM AND REGIONAL TECTONICS **c46**
David A. Dinter *In its* US Geological Survey Polar Res. Symp. 1983 p 37-38 refs (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

Shallow sedimentary strata underlying the middle and outer continental shelf of the Alaskan Beaufort Sea compose, in general, a sequence of wedges, each of which thickens seaward to the shelf break. At least seven such wedges, with maximum seaward thicknesses on the order of 15 to 40 meters, are recognized on high resolution seismic reflection profiles. The wedges are bounded by disconformities that presumably represent successive subaerial exposures of the shelf during Quaternary glacioeustatic sealevel minima. Many of these surfaces are intermittently channeled beneath the middle shelf, and some are overlain by thin, discontinuous, acoustically choatic layers inferred to be nonmarine or shallow marine in origin. Author

N84-23969*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A COMPARISON OF NUMERICAL RESULTS OF ARCTIC SEA ICE MODELING WITH SATELLITE IMAGES Abstract Only **c48**
Chi-Hai Ling (Geological Survey, Washington, D.C.) and Claire Parkinson *In* Geological Survey US Geological Survey Polar Res. Symp. 1983 p 40 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD CSCL 08L

Observations made from 1972 to 1976 with the Electrically Scanning Microwave Radiometer on board the Nimbus 5 Satellite provide sequential synoptic information of the Arctic sea ice cover.

This 4 year data set was used to construct a fairly continuous series of 3 day average 19-GHz passive microwave images which has become a valuable source of polar information, yielding many anticipated and unanticipated discoveries of the sea ice canopy observed in its entirety through the clouds and during the polar night. Interpretation of the passive microwave satellite data set was performed by comparing selected sequential images with correspondin microwave profiles and images acquired by the NASA CV-990 airborne laboratory and with various in situ microwave and physical observations. Author

N84-23970# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ARCTIC SEA ICE BY PASSIVE MICROWAVE OBSERVATIONS FROM THE NIMBUS-5 SATELLITE Abstract Only c48
William J. Campbell (Geological Survey, Washington, D.C.), Per Gloersen, and H. Jay Zwally (NASA. Goddard Space Flight Center, Tacoma, Wash.) *In* Geological Survey US Geological Survey Polar Res. Symp. 1983 p 40-41 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD CSCL 08L

The results of a dynamic/thermodynamic numerical model of Arctic sea ice are compared with satellite images from the Nimbus 5 electrically scanning microwave radiometer. The model combines aspects of two previous sea ice models those of Parkinson and Washington and Ling, Rasmussen, and Campbell. A solid/fluid model basically follows the formulation of the Parkinson and Washington model with the addition of the constitutive equation and equation of state from the Ling model. The Parkinson and Washington model simulates the seasonal cycle of sea ice thicknesses and concentrations with a horizontal resolution of roughly 200 km and a timestep of 8 hours. The thermodynamics are calculated through energy balances at the interfaces between ice and air, water and ice, and water and air. The ice dynamics are calculated through a momentum equation balancing air stress, water stress, dynamic topography, and Coriolis force, with an adjustment for internal ice resistance. Author

N84-23971# Technicolor Government Services, Inc., Moffett Field, Calif.
LAND COVER AND TERRAIN MAPPING FOR THE DEVELOPMENT OF DIGITAL DATA BASES FOR WILDLIFE HABITAT ASSESSMENT IN THE YUKON FLATS NATIONAL WILDLIFE REFUGE, ALASKA c43
Mark B. Shasby, Carl Markon (US Fish and Wildlife Service), Michael D. Fleming, Dennis L. Murphy, and James E. York *In* Geological Survey US Geological Survey Polar Res. Symp. 1983 p 43 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

LANDSAT multispectral scanner (MSS) data and digital elevation model (DEM) data are studied to develop and test digital land cover and terrain data bases for assessing wildlife habitat in Alaska's National Wildlife Refuges (NWR). The Yukon Flats NWP consists of approximately 8.63 million acres of land and water in the upper watershed of the Yukon River in northeastern Alaska. Portions of seven summer and five winter LANDSAT scenes were digitally registered to a 127-meter Universal Transverse Mercator (UTM) grid and processed to derive land cover information for the refuge and an additional 4.5 million acres of adjacent lands. The lake inventory data base is developed through a series of computer programs which extract all water bodies from the land cover layer of data in raster format, to produce a new layer comprised only of water, and then convert the raster file to a vector data file from which a data base file is produced. Author

N84-23972# Geological Survey, Washington, D. C.
GEOCHEMICAL DETECTION OF PROSPECTIVE PETROLEUM AREAS IN ARCTIC REGIONS Abstract Only c43
A. A. Roberts, T. J. Donovan, J. D. Hendricks, and K. I. Cunningham *In its* US Geological Survey Polar Res. Symp. 1983 p 43 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

Geochemical prospecting for petroleum is based on the premise that microseepage of compounds from oil and gas reservoirs does occur and that these compounds subsequently migrate to the Earth's surface. These techniques involve the detection of epigenetic alteration of near-surface rocks due to the presence of these seeping hydrocarbons, or the detection of alterations of the chemical composition of the near-surface soils and soil gases themselves. Two geochemical exploration techniques that were developd for use in the continguous United States were investigated for their applicability in the permafrost environment of the Arctic coastal plain. The first of these involves the detection of anomalously high concentrations of the noble gas helium in near-surface permafrost. The second technique involves the detection of anomalous shallow-subsurface occurrences of magnetic minerals through the use of low-altitude (90 m), special purpose, aeromagnetic surveys. Author

N84-23973# Geological Survey, Washington, D. C.
HYDROLOGY OF THE NORTH SLOPE, ALASKA Abstract Only c43
Charles E. Sloan *In its* US Geological Survey Polar Res. Symp. 1983 p 44 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

The hydrology of the North Slope is dominated by the cold, dry climate and permafrost. Streamflow virtually ceases during the long winter. Precipitation occurs mainly as snow from September to May and is stored in the snowpack until breakup, a dynamic flow period in late May and early June. Most of the annual runoff occurs in the brief 2- to 3-week breakup period. The estimated mean annual runoff on the North Slope averages about 0.5 cubic feet per second per square mile and ranges from about 0.3 on the Coastal Plain to about 2.0 in the mountains. Peak flows usually occur during spring breakup when the height of the flood flow is significantly increased by the presence of ice jams. Maximum evident floods range from about 7 to 80 and average about 40 cubic feet per second per square mile in large streams on the North Slope. Author

N84-23974*# Lunar and Planetary Inst., Houston, Tex.
[ACTIVITIES AT THE LUNAR AND PLANETARY INSTITUTE] Semiannual Status Report, 1 Jul. - 31 Dec. 1983
Kevin Burke 23 Apr. 1984 55 p
(Contract NASw-3389)
(NASA-CR-173528; NAS 1.26:173528) Avail: NTIS HC A04/MF A01

The scientific and administrative activities of the Lunar and Planetary Institute are summarized. Recent research relating to geophysics, planetary geology, the origin of the Earth and Moon, the lunar surface, Mars, meteorites, and image processing techniques is discussed. R.S.F.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N84-23975*# National Aeronautics and Space Administration, Washington, D. C.
EARTH RESOURCES: A CONTINUING BIBLIOGRAPHY WITH INDEXES
Apr. 1984 134 p
(NASA-SP-7041(41); NAS 1.21:7041(41)) Avail: NTIS HC $12.50 CSCL 05B

This bibliography lists 475 reports, articles and other documents introduced into the NASA scientific and technical information system between January 1 and March 31, 1984. Emphasis is placed on the use of remote sensing and geophysical instrumentation in spacecraft and aircraft to survey and inventory natural resources and urban areas. Subject matter is grouped according

to agriculture and forestry, environmental changes and cultural resources, geodesy and cartography, geology and mineral resources, hydrology and water management, data processing and distribution systems, instrumentation and sensors, and economical analysis. E.A.K.

N84-23976*# Utah Univ., Salt Lake City. Center for Remote Sensing and Cartography.

RIPARIAN HABITAT ON THE HUMBOLDT RIVER, DEETH TO ELKO, NEVADA

Kevin P. Price and Merrill K. Ridd Dec. 1983 48 p refs ERTS (Grant NAGw-95)

(E84-10116; NASA-CR-173486; NAS 1.26:173486; CRSC-83-3) Avail: NTIS HC A03/MF A01 CSCL 08B

A map inventory of the major habitat types existing along the Humbolt River riparian zone in Nevada is described. Through aerial photography, 16 riparian habitats are mapped that describe the ecological relationships between soil and vegetation types, flooding and soil erosion, and the various management practices employed to date. The specific land and water management techniques and their impact on the environment are considered. M.A.C.

N84-23977*# Michigan State Univ., East Lansing. Center for Remote Sensing.

USE OF REMOTE SENSING FOR LAND USE POLICY FORMULATION Annual Progress Report, 1 Jun. 1982 - 31 May 1983

31 May 1983 132 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS

(Grant NGL-23-004-083)

(E84-10117; NASA-CR-173487; NAS 1.26:173487) Avail: NTIS HC A07/MF A01 CSCL 08B

Multispectral scanning, infrared imagery, thematic mapping, and spectroradiometry from LANDSAT, GOES, and ground based instruments are being used to determine conifer distribution, maximum and minimum temperatures, topography, and crop diseases in Michigan's lower Peninsula. Image interpretation and automatic digital processing information from LANDSAT data are employed to classify and map the coniferous forests. Radiant temperature data from GOES were compared to temperature readings from the climatological station network. Digital data from LANDSAT is being used to develop techniques for detecting, monitoring, and modeling land surface change. Improved reflectance signatures through spectroradiometry aided in the detection of viral diseases in blueberry fields and vineyards. Soil survey maps from aerial reconnaissance are included as well as information on education, conferences, and awards. M.A.C.

N84-23978*# Delaware Univ., Newark. Coll. of Marine Studies.

EVALUATION OF SPATIAL, RADIOMETRIC AND SPECTRAL THEMATIC MAPPER PERFORMANCE FOR COASTAL STUDIES Quarterly Technical Status Progress Report, 1 Jan. - 31 Mar. 1984

V. Klemas, Principal Investigator 31 Mar. 1984 5 p ERTS (Contract NAS5-27580)

(E84-10118; NASA-CR-173488; NAS 1.26:173488) Avail: NTIS HC A02/MF A01 CSCL 08B

The effect different wetland plant canopies have upon observed reflectance in Thematic Mapper bands is examined. The three major vegetation canopy types (broadleaf, gramineous and leafless) produce unique spectral responses for a similar quantity of live biomass. Biomass estimates computed from spectral data were most similar to biomass estimates determined from harvest data when models developed for a specific canopy were used. Precise determination of regression coefficients for each canopy type and modeling changes in the coefficients with various combinations of canopy types are being tested. The multispectral band scanner vegetation index estimates are very similar to the vegetation index estimates. M.A.C.

N84-23979*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

UTILIZATION OF DIGITAL LANDSAT IMAGERY FOR THE STUDY OF GRANITOID BODIES IN RONDONIA: CASE EXAMPLE OF THE PEDRA BRANCA MASSIF [UTILIZACAO DE IMAGENS DIGITAIS LANDSAT NO ESTUDO DE CORPOS GRANITOIDES EM RONDONIA: CASO-EXEMPLO DO MACICO PEDRA-BRANCA]

Nelson de Jesus Parada, Principal Investigator, Raimundo Almeidaflho, Bruno L. Payolla, Onofre G. dePinho, and Jorge S. Bettencourt Jan. 1984 11 p refs In PORTUGUESE; ENGLISH summary Presented at the 2nd Simp. Amazonica, Manaus, Brazil, 8-15 Apr. 1984 Sponsored by NASA ERTS

(E84-10120; NASA-CR-172795; NAS 1.26:172795; INPE-2995-PRE/447) Avail: NTIS HC A02/MF A01 CSCL 05B

Analysis of digital multispectral MSS-LANDSAT images enhanced through computer techniques and enlarged to a video scale of 1:100.000, show the main geological and structura features of the Pedra Branca granitic massif in Rondonia. These are not observed in aerial photographs or adar images. Field work shows that LANDSAT photogeological units correspond to different facies of granitic rocks in the Pedra Branca massif. Even under the particular characteristics of Amazonia (Tropical Forest, deep weathering, and Quaternary sedimentary covers), an adequate utilization of orbital remote sensing images can be important tools for the orientation of field works. M.A.C.

N84-23980*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

EVALUATION OF THE EFFECTS OF THE SEASONAL VARIATION OF SOLAR ELEVATION ANGLE AND AZIMUTH ON THE PROCESSES OF DIGITAL FILTERING AND THEMATIC CLASSIFICATION OF RELIEF UNITS [AVALIACAO DOS EFEITOS DA VARIACAO SAZONAL DO ANGULO DE ELEVACAO SOLAR E AZIMUTE SOBRE PROCESSOS DE FILTRAGEM DIGITAL E CLASSIFICACAO TEMATICA DO RELEVO]

Nelson de Jesus Parada, Principal Investigator and Evlyn M. L. M. Novo Aug. 1983 36 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS

(E84-10121; NASA-CR-172796; NAS 1.26:172796; INPE-2858-RPE/440) Avail: NTIS HC A03/MF A01 CSCL 05B

The effects of the seasonal variation of illumination over digital processing of LANDSAT images are evaluated. Two sets of LANDSAT data referring to the orbit 150 and row 28 were selected with illumination parameters varying from 43 deg to 64 deg for azimuth and from 30 deg to 36 deg for solar elevation respectively. IMAGE-100 system permitted the digital processing of LANDSAT data. Original images were transformed by means of digital filtering so as to enhance their spatial features. The resulting images were used to obtain an unsupervised classification of relief units. Topographic variables (declivity, altitude, relief range and slope length) were used to identify the true relief units existing on the ground. The LANDSAT over pass data show that digital processing is highly affected by illumination geometry, and there is no correspondence between relief units as defined by spectral features and those resulting from topographic features. M.A.C.

N84-23981*# Arizona Univ., Tucson.

INVESTIGATION OF SEVERAL ASPECTS OF LANDSAT-4 DATA QUALITY Quarterly Progress Report

Robert C. Wrigley, Principal Investigator 20 Mar. 1984 10 p Sponsored by NASA ERTS

(E84-10122; NASA-CR-172797; NAS 1.26:172797) Avail: NTIS HC A02/MF A01 CSCL 05B

The Thematic Mapper scene of Sacramento, CA acquired during the TDRSS test was received in TIPS format. Quadrants for both scenes were tested for band-to-band registration using reimplemented block correlation techniques. Summary statistics for band-to-band registrations of TM band combinations for Quadrant 4 of the NE Arkansas scene in TIPS format are tabulated as well as those for Quadrant 1 of the Sacramento scene. The system MTF analysis for the San Francisco scene is completed.

The thermal band did not have sufficient contrast for the targets used and was not analyzed. A.R.H.

N84-23982*# Utah Univ., Salt Lake City. Center for Remote Sensing and Cartography.
ENVIROPOD HANDBOOK: A GUIDE TO PREPARATION AND USE OF THE ENVIRONMENTAL PROTECTION AGENCY'S LIGHT-WEIGHT AERIAL CAMERA SYSTEM
Stephen J. Brower and Merrill K. Ridd Mar. 1984 67 p ERTS
(Grant NAGw-95)
(E84-10123; NASA-CR-172798; NAS 1.26:172798; CRSC-84-1) Avail: NTIS HC A04/MF A01 CSCL 14E

The use of the Environmental Protection Agency (EPA) Enviropod camera system is detailed in this handbook which contains a step-by-step guide for mission planning, flights, film processing, indexing, and documentation. Information regarding Enviropod equipment and specifications is included. A.R.H.

N84-23983*# Utah Univ., Salt Lake City. Center for Remote Sensing and Cartography.
EPA ENVIROPOD. A SUMMARY OF THE USE OF THE ENVIROPOD UNDER A MEMORANDUM OF UNDERSTANDING AMONG EPA REGION 8, THE STATE OF UTAH, AND THE UNIVERSITY OF UTAH RESEARCH INSTITUTE Annual Report, 1 Mar. 1983 - 28 Feb. 1984
Merrill K. Ridd Mar. 1984 37 p Sponsored by NASA ERTS
(E84-10124; NASA-CR-172799; NAS 1.26:172799; CRSC-84-2) Avail: NTIS HC A03/MF A01 CSCL 08B

Twenty-three missions were flown using the EPA's panoramic camera to obtain color and color infrared photographs of landslide and flood damage in Utah. From the state's point of view, there were many successes. The biggest single obstacle to smooth and continued performance was unavailable aircraft. The Memorandum of Understanding between the State of Utah, the Environmental Protection Agency, and the Center for Remote Sensing and Cartography is included along with forms for planning enviropod missions, for requesting flights, and for obtaining feedback from participating agencies. A.R.H.

N84-23984*# Utah Univ., Salt Lake City. Center for Remote Sensing and Cartography.
IDENTIFYING ENVIRONMENTAL FEATURES FOR LAND MANAGEMENT DECISIONS Semiannual Report
Apr. 1984 27 p ERTS
(Grant NAGw-95)
(E84-10125; NASA-CR-172800; NAS 1.26:172800) Avail: NTIS HC A03/MF A01 CSCL 08B

Multivariate statistical analysis and imaging processing techniques are being applied to the study of arid/semiarid environments, with emphasis on desertification. Field level indicators of land-soil biota degradation are being sifted out with staging up to the low aircraft reconnaissance level, to LANDSAT TM & MSS, and even to the AVHRR level. Three completed projects are reviewed: riparian habitat on the Humboldt River floodplain, Salt Lake County Urban expansion detection, and salinization/desertification detection in the delta area. Beginning projects summarized include: comparative condition of rangeland in Rush Valley; modeling a GIS/remote sensing data base for Cache County; universal soil loss equation applied to Pinyon-Juniper; relating MSS to ground radiometry near Battle Mountain; and riparian habitat mapping on Mary's River, Nevada. A.R.H.

N84-23985*# Council of State Governments, Washington, D.C.
STATE REMOTE SENSING (LANDSAT) PROGRAMS CATALOG
Mar. 1981 71 p Sponsored by NASA and Council of State Planning Agencies ERTS
(E84-10127; NASA-CR-172802; NAS 1.26:172802) Avail: NTIS HC A04/MF A01 CSCL 05B

This directory lists the technical capabilities, personnel, and program structure for remote sensing activities as they existed in each state in late 1980. The institutional framework, participating agencies, applications, status, equipment, software, and funding sources are also indicated. A.R.H.

N84-23986*# Mississippi State Univ., Mississippi State. Mississippi Remote Sensing Center.
APPLICATION OF REMOTE SENSING TO STATE AND REGIONAL PROBLEMS Semiannual Progress Report, 1 Nov. 1983 - 30 Apr. 1984
W. Frank Miller, Principal Investigator, John Tingle, Linda H. Wright, and Brice Tebbs 1 May 1984 60 p ERTS
(Grant NGL-25-001-054)
(E84-10128; NASA-CR-172803; NAS 1.26:172803; SAPR-21) Avail: NTIS HC A04/MF A01 CSCL 05B

Progress was made in the hydroclimatology, habitat modeling and inventory, computer analysis, wildlife management, and data comparison programs that utilize LANDSAT and SEASAT data provided to Mississippi researchers through the remote sensing applications program. Specific topics include water runoff in central Mississippi, habitat models for the endangered gopher tortoise, coyote, and turkey Geographic Information Systems (GIS) development, forest inventory along the Mississippi River, and the merging of LANDSAT and SEASAT data for enhanced forest type discrimination. M.A.C.

N84-23987*# City Univ. Inst. of Marine and Atmospheric Sciences, New York.
A SEASAT SASS SIMULATION EXPERIMENT TO QUANTIFY THE ERRORS RELATED TO A + OR - 3 HOUR INTERMITTENT ASSIMILATION TECHNIQUE
Winfield B. Sylvester May 1984 92 p refs ERTS
(Grant NAGw-266)
(E84-10129; NASA-CR-3799; NAS 1.26:3799) Avail: NTIS HC A05/MF A01 CSCL 05B

A series of SEASAT repeat orbits over a sequence of best Low center positions is simulated by using the Seatrak satellite calculator. These Low centers are, upon appropriate interpolation to hourly positions, Located at various times during the + or - 3 hour assimilation cycle. Error analysis for a sample of best cyclone center positions taken from the Atlantic and Pacific oceans reveals a minimum average error of 1.1 deg of Longitude and a standard deviation of 0.9 deg of Longitude. The magnitude of the average error seems to suggest that by utilizing the + or - 3 hour window in the assimilation cycle, the quality of the SASS data is degraded to the Level of the background. A further consequence of this assimilation scheme is the effect which is manifested as a result of the blending of two or more more juxtaposed vector winds, generally possessing different properties (vector quantity and time). The outcome of this is to reduce gradients in the wind field and to deform isobaric and frontal patterns of the intial field. A.R.H.

N84-23988# Geological Survey, Washington, D. C.
GEOTHERMAL RESOURCES OF SOUTHERN IDAHO
Don R. Mabey 1983 28 p refs
(USGS-Circ-866) Avail: NTIS HC A03/MF A01

The geothermal resource of southern Idaho as assessed by the U.S. Geological Survey in 1978 is large. Most of the known hydrothermal systems in southern Idaho have calculated reservoir temperatures of less than 150 C. Water from many of these systems is valuable for direct heat applications. A majority of the known and inferred geothermal resources of southern Idaho underlie the Snake River Plain. However, major uncertainties exist concerning the geology and temperatures beneath the plain. The largest hydrothermal system in Idaho is in the Bruneau-Grang View area of the western Snake River Plain with a calculated reservoir temperature of 107 C and an energy of 4.5 x 10 to the 20th power joules. No evidence of higher temperature water associated with this system was found. Although the geology of the eastern Snake River Plain suggests that a large thermal anomaly may underlie this area of the plain, direct evidence of high temperatures was not found. Large volumes of water at temperatures between 90 and 150 C probably exist along the margins of the Snake River Plain and in local areas north and south of the plain. R.S.F.

N84-23989*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MICROWAVE RADIOMETER EXPERIMENT OF SOIL MOISTURE

SENSING AT BARC TEST SITE DURING SUMMER 1981
J. Wang, T. Jackson (USDA/ARS Beltsville Agricultural Research Center), E. Engman (USDA/ARS Beltsville Agricultural Research Center), W. Gould, J. Fuchs, W. Glazer, P. ONeill, T. Schmugge, and J. McMurtrey (USDA/ARS Beltsville Agricultural Research Center) Jan. 1984 259 p
(NASA-TM-86056; NAS 1.15:86056) Avail: NTIS HC A12/MF A01 CSCL 08M

Soil moisture was measured by truck mounted microwave radiometers at the frequencies of 1.4 GHz, 5 GHz, and 10.7 GHz. The soil textures in the two test sites were different so that the soil type effect of microwave radiometric response could be studied. Several fields in each test site were prepared with different surface roughnesses and vegetation covers. Ground truth on the soil moisture, temperature, and the biomass of the vegetation was acquired in support of the microwave radiometric measurements. Soil bulk density for each of the fields in both test sites was sampled. The soils in both sites were measured mechanically and chemically. A tabulation of the measured data is presented and the sensors and operational problems associated with the measurements are discussed. E.A.K.

N84-23990# Michigan State Univ., East Lansing. Center for Remote Sensing.
AERIAL PHOTOGRAPHY FOR ECOLOGICAL SITE MAPPING
William D. Hudson and David P. Lusch Mar. 1984 13 p refs
Avail: NTIS HC A02/MF A01

The use of aerial imagery to classify forest lands into ecologically similar units was illustrated. An example of a regional analysis of the inter-relationships between generalized physiographic subdivisions and forest patterns, interpreted from satellite data, was contrasted with a more detailed study which utilized medium-scale photographs. Ecosystem units were distinguished on the basis of physiography, soils, and vegetation. Two of these ecosystem factors, physiography and vegetation, were identified and mapped using remotely sensed imagery data from LANDSAT 4. Vegetation/physiography profiles were generated from both studies undertaken. The photography and generalized forest cover distributions mapped at the regional level illustrate the potential for identifying broad, ecologically similar units from satellite data. Within these larger units, more detailed studies of aerial photography can provide a method of classifying individual landforms into ecological sites. R.S.F.

N84-23991*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PREDICTABILITY OF THE EARTH'S POLAR MOTION
B. Fong Chao Apr. 1984 21 p refs
(NASA-TM-86095; NAS 1.15:86095) Avail: NTIS HC A02/MF A01 CSCL 08E

A comprehensive, experimental study of the predictability of the polar motion using a homogeneous BIH (Bureau International de l'Heure) data set is presented. Based on knowledge of the physics of the annual and the Chandler wobbles, the numerical model for the polar motion is constructed by allowing the wobble periods to vary. Using an optimum base length of 6 years for prediction, this floating-period model, equipped with a non-linear least-squares estimator, is found to yield polar motion predictions accurate from 0.012 to 0.024 inches depending on the prediction length up to one year, corresponding to a predictability of 91-83%. This represents a considerable improvement over the conventional fixed-period predictor, which does not respond to variations in the apparent wobble periods. The superiority of the floating-period predictor to other predictors based on critically different numerical models is also demonstrated. M.A.C.

N84-23992# Pacific Northwest Lab., Richland, Wash.
RELATIONSHIP OF REGIONAL WATER QUALITY TO AQUIFER THERMAL ENERGY STORAGE
R. D. Allen and J. R. Raymond Oct. 1983 22 p refs Presented at 6th Miami Internatl. Conf. on Alternative Energy Sources, Miami Beach, Fla., 12 Dec. 1983
(Contract DE-AC06-76RL-01830)
(DE84-006649; PNL-SA-11597; CONF-831205-8) Avail: NTIS HC A02/MF A01

Aquifer thermal energy storge (ATES) involves injection and withdrawal of temperature-conditioned water into and from a permeable water-bearing formation. The purpose of this study was to assess ground-water quality and associated geologic characteristics as they may affect the feasibility of ATES system development in any hydrologic region. It was determined that seven physical and chemical mechanisms may decrease system efficiency: particulate plugging, chemical precipitation, clay mineral dispersion, piping corrosion, aquifer disaggregation, mineral oxidation, and proliferation of biota. Factors affecting ground-water chemistry are pressure, temperature, pH, ion exchange, evaporation/transpiration, and co-mingling with diverse waters. Modeling with the MINTEQ code showed three potential reactions: precipitation of calcium carbonate at raised temperature; solution of silica at raised temperature followed by precipitation at reduced temperature; and oxidation/precipitation of iron compounds. Ameliorative chemical procedures are available. Low concentrations of solutes are generaly favorable for ATES. Near-surface waters in high precipitation regions are low in salinity. Ground water recharged from fresh surface waters also has reduced salinity. DOE

N84-23993# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A CONSTRAINED-CLUSTERING APPROACH TO THE ANALYSIS OF REMOTE SENSING DATA M.S. Thesis
C. J. Ryan 1983 136 p
(AD-A139124; AFIT/CI/NR-83-80T) Avail: NTIS HC A07/MF A01 CSCL 12/1

One old and two new clustering methods were applied to the constrained-clustering problem of separating different agricultural fields based on multispectral remote sensing satellite data. (Constrained-clustering involves double clustering in multispectral measurement similarity and geographical location.) The results of applying the three methods are provided along with a discussion of their relative strengths and weaknesses and a detailed description of their algorithms. GRA

N84-23994# Yale Univ., New Haven, Conn. Dept. of Computer Science.
REPRESENTING AND ACQUIRING GEOGRAPHIC KNOWLEDGE Ph.D. Thesis
E. S. Davis Jan. 1984 251 p
(Contract N00014-83-K-0281)
(AD-A139308; YALEU/DCS/RR-292) Avail: NTIS HC A12/MF A01 CSCL 08/2

This thesis presents a computational model of memory for spatial relations; how knowledge of geography may be represented, retrieved, and acquired. We focus particularly on the problems of representing incomplete and inexact information in a knowledge base and of learning a large scale area from a sequence of small scale views of the area. Our model, called MERCATOR, includes an original representation scheme for two-dimensional space; routines that retrieve information from the knowledge base in useful form; and a routine (the assimilator) that builds up a knowledge base incrementally from a sequence of scene descriptions. All these have been implemented in a running computer program. The representation approximates object boundaries in terms of sequences of straight edges, and it records object positions in terms of the dimensions of edges. Inexactness information is represented by recording bounds on edge dimensions and on the maximal distance from an edge to a boundary. Incomplete information is represented by recording only part of the boundary and interior of an object. This scheme is capable of representing many kinds of situations and of partial states of knowledge. The assimilator consists of two parts. The matcher finds correspondences between a scene description and the knowledge base. The merger adds the new information from the scene description into the knowledge base. The major result of this thesis is that a representation of space should integrate shape and positional information, but should maintain an abstract level of geometric description separate from object descriptions. GRA

N84-23995# Stanford Univ., Calif. Dept. of Computer Science.
PRELIMINARY DSRS DESIGN Final Technical Report, 1 Jun. 1982 - 1 Apr 1983
T. O. Binford and H. H. Baker Griffiss AFB, N.Y. RADC Sep. 1983 82 p
(Contract F30602-81-C-0169; AF Proj. R256)
(AD-A138890; RADC-TR-83-216) Avail: NTIS HC A05/MF A01 CSCL 08/2

This report describes Stanford's approach to stereo mapping. This includes geometric modeling, computer vision and rule synthesis (with mono and stereo information). Also described are an improved edge operator (by Mairmont) and Stanford's analysis of epipolar geometry. A source code listing (in SAIL) of the epipolar analysis program is included. Author (GRA)

N84-23996# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Lab.
SURVEY OF AUTOMATED STATEWIDE NATURAL RESOURCE INFORMATION SYSTEMS Final Report
E. M. Causey Jan. 1984 46 p
(AD-A139017; WES/MP/EL-84-1) Avail: NTIS HC A03/MF A01 CSCL 08/6

This report contains the results of a survey to determine which states maintain a geographically referenced computer-based natural resource information system (NRIS). Twenty-two states currently have an NRIS in varying stages of development. A brief description of each system is included in Appendix A of this report. GRA

N84-23997# Arizona State Univ., Tempe. Center for Environmental Studies.
REVEGETATION METHODS FOR ARID AREAS, REVISED
C. Willis and D. Patten 18 Aug. 1983 12 p
(Contract DACW09-80-M-1205)
(AD-A139088) Avail: NTIS HC A02/MF A01 CSCL 02/4

In many areas in the Southwest deserts conditions favoring reestablishment of vegetation may only occur every four to seven years (Hassell 1977, Cook et al. 1974). For this reason, successful revegetation of disturbed desert lands requires special methods to prolong or take advantage of favorable moisture periods. In addition to moisture stress, soil fertility and toxicity problems are also common on areas in need of revegetation. Several agencies deal successfully with these problems. Most notable in terms of large scale revegetation efforts, are the highway departments and mining companies. Smaller organizations specialize in various aspects of revegetation such as transplanting techniques or seeding operations. This paper reviews reclamation practices currently used by the Arizona Department of Transportation, and methods recommended for revegetation of surface mining operations. In addition, transplanting techniques used by the Desert Botanical Garden in Phoenix, Arizona are briefly discussed. GRA

N84-23998# Interior Dept., Washington, D.C. Office of the Secretary.
ALASKA'S MINERAL RESOURCES Annual Report, 1983
1983 52 p refs
(DE84-006918; GEOL-SURVEY-CIRC-908; DOE/NBM-4006918)
Avail: NTIS HC A04/MF A01

Activity during 1982 in Alaska which relate to oil and gas, uranium, coal and peat, geothermal resources, and nonfuel, critical and strategic minerals is described. DOE

N84-23999# Geological Survey, Harrisburg, Pa. Water Resource Div.
WATER RESOURCES DATA FOR PENNSYLVANIA, WATER YEAR 1982. VOLUME 1: DELAWARE RIVER BASIN Annual Water-data Report, 1 Oct. 1981 - 30 Sep. 1982
Andrew Voytik, Thomas E. White, Deloris W. Speight, and Kevin P. Gillespie Nov. 1983 263 p refs 3 Vol.
(PB84-161579; USGS/WRD/HD-84/007; USGS/WRD/PA-82/1)
Avail: NTIS HC A12/MF A01 CSCL 08H

Water resources data for the 1982 water year for Pennsylvania consist of records of discharge and water quality of streams; elevation and contents of lakes and reservoirs; and elevation of tides; and water levels of ground-water wells. Records for water discharge at 66 gaging stations; elevation and contents at 11 lakes and reservoirs; elevation of tides at 1 gaging station; water quality at 33 gaging stations; and water levels at 16 observation wells are given. Also included are data for 34 crest-stage, 80 low-flow, and 43 water-quality partial-record stations. Author (GRA)

N84-24000# Geological Survey, Boston, Mass. Water Resources Div.
WATER RESOURCES DATA FOR NEW HAMPSHIRE AND VERMONT, WATER YEAR 1982 Annual Water-data Report, 1 Oct. 1981 - 30 Sep. 1982
F. E. Blackey, J. E. Cotton, and K. W. Toppin Dec. 1983 156 p refs
(PB84-161868; USGS/WRD/HD-84/009;
USGS/WRD/NH/VT-82/1) Avail: NTIS HC A08/MF A01 CSCL 08H

Water-resources data for the 1982 water year for New Hampshire and Vermont consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and ground-water levels. Discharge records for 73 gaging stations, stage records for 4 lakes, month end contents for 25 lakes and reservoirs, water-quality data for 4 gaging stations, and water levels for 30 observation wells are given. Also included are data for 3 crest-stage partial-record stations. Author (GRA)

N84-24001# Geological Survey, Orlando, Fla. Water Resources Div.
WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1982. VOLUME 1B: NORTHEAST FLORIDA GROUND WATER Annual Water-data Report, 1 Oct. 1981 - 30 Sep. 1982
L. D. Fayard, D. M. Bonnet, and R. G. Belles 1983 233 p refs 4 Vol.
(PB84-161876; USGS/WRD/HD-82/084; USGS/WDR/FL-82/1B)
Avail: NTIS HC A11/MF A01 CSCL 08H

Water resources data for the 1982 water year for northeast Florida includes continuous or daily discharge for 61 streams, periodic for 21 streams, peak discharge for 29 streams, low-flow discharge for 2 streams, continuous or daily stage for 73 streams; continuous elevations for 40 lakes and periodic elevations for 15 lakes; continuous ground water levels for 32 wells, periodic ground water levels for 91 wells, and miscellaneous water level measurements for 779 wells; quality of water for 23 surface water sites and for 173 wells. Author (GRA)

N84-24002# Geological Survey, Orlando, Fla. Water Resources Div.
WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1982. VOLUME 1A: NORTHEAST FLORIDA SURFACE WATER Annual Water-data Report, 1 Oct. 1981 - 30 Sep. 1982
L. D. Fayard, R. A. Bird, A. L. Bonnet, and A. Summerlin Sep. 1983 302 p refs 4 Vol.
(PB84-162338; USGS/WRD/FL-82/1A; USGS/WRD/HD-83/083)
Avail: NTIS HC A14/MF A01 CSCL 08H

Water resources data for the 1982 water year in Florida consists of continuous or daily discharge for 61 streams, periodic discharge for 8 streams, miscellaneous discharge for 21 streams, peak discharge for 29 streams, low-flow discharge for 2 streams, continuous or daily stage for 73 streams; continuous elevations for 40 lakes and periodic elevations for 15 lakes; continuous ground water levels for 32 wells, periodic ground water levels for 91 wells, and miscellaneous water level measurements for 779 wells; quality of water for 23 surface water sites and for 173 wells. Author (GRA)

N84-24003# Geological Survey, Columbia, S.C. Water Resources Div.
WATER RESOURCES DATA FOR SOUTH CAROLINA, WATER YEAR 1982 Annual Water-data Report, 1 Oct. 1981 - 30 Sep. 1982

C. S. Bennett, R. D. Hayes, J. W. Gissendanner, and H. E. Herlong Sep. 1983 344 p refs
(PB84-162577; USGS/WRD/HD-82/078; USGS-WRD-SC-82-1) Avail: NTIS HC A15/MF A01 CSCL 08H

Water resources data for the 1982 water year for South Carolina consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground-water wells. This volume contains records for water discharge at 78 gaging stations, stage only at 5 gaging stations, stage and contents at 11 lakes and reservoirs, water quality at 37 gaging stations, and water levels at 57 observation wells. Also included are data for 42 crest-stage partial-record stations. GRA

N84-24004# Geological Survey, Louisville, Ky. Hydrologic Data Section.
WATER RESOURCES DATA, KENTUCKY WATER YEAR 1982
J. M. Bettandorff, J. N. Sullavan, D. W. Leist, and D. V. Whitesides May 1983 527 p refs Prepared in cooperation with Kentucky Univ., Lexington
(PB84-162320; USGS/WRD/HD-82/050; USGS/WRD/KY-82/1) Avail: NTIS HC A23/MF A01 CSCL 08H

Water resources data for the 1982 water year for Kentucky consist of records of stage, discharge, and water quality of streams; stage and contents of lakes; and water levels and water quality of wells and springs. This report contains discharge record from 115 gaging stations; stage and contents for 15 lakes; suspended-sediment data for 38 stations (12 daily); daily temperature records for 26 stations; daily specific conductance for 14 stations; ground-water level for 75 recording, 99 partial and miscellaneous temperature and specific conductance from the 115 gaging stations. Also included are data for 118 partial-record crest-stage sites. GRA

N84-24005# Geological Survey, Portland, Oreg. Water Resources Div.
WATER RESOURCES DATA FOR OREGON, WATER YEAR 1982. VOLUME 1: EASTERN OREGON Annual Water-Data Report, 1 Oct. 1981 - 30 Sep. 1982
L. L. Hubbard, T. D. Parks, D. L. Weiss, and L. E. Hubbard 1983 217 p refs
(PB84-164326; USGS/WRD/HD-84/005-Vol-1; USGS/WDR/OR-82/1-Vol-1) Avail: NTIS HC A06/MF A01 CSCL 08H

Water resources data for the 1982 water year for Oregon consist of records of stage, discharge, and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. This report, in two volumes, contains discharge records for 253 gaging stations; stage only records for 8 gaging stations; stage and contents for 37 lakes and reservoirs; water quality for 81 gaging stations, water levels for 57 observations wells; and water quality for 4 precipitation stations. Also included are 33 crest-stage partial-record stations. GRA

N84-24006# Geological Survey, Portland, Oreg. Water Resources Div.
WATER RESOURCES DATA FOR OREGON, WATER YEAR 1982. VOLUME 2: WESTERN OREGON Annual Water-Data Report, 1 Oct. 1981 - 30 Sep. 1982
L. L. Hubbard, T. D. Parks, D. L. Weiss, and L. E. Hubbard Nov. 1983 433 p refs
(PB84-164334; USGS/WRD/HD-84/006-Vol-2) Avail: NTIS HC A19/MF A01 CSCL 08H

Water resources data for the 1982 water year for Oregon consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. This report, in two volumes, contains discharge records for 253 gaging stations; stage only records for 8 gaging stations; stage and contents for 37 lakes and reservoirs; water quality for 81 gaging stations, water levels for 57 observations wells; and water quality for 4 precipitation stations. Also included are 33 crest-stage partial-record stations. GRA

N84-24007# Geological Survey, St. Paul, Minn. Water Resources Div.
WATER RESOURCES DATA FOR MINNESOTA, WATER YEAR 1982. VOLUME 1: GREAT LAKES AND SOURIS-RED-RAINY RIVER BASINS Annual Water-resources Investigations, 1 Oct. 1981 - 30 Sep. 1982
K. T. Gunard, J. H. Hess, J. L. Zirbel, and C. E. Cornelius Oct. 1983 224 p refs
(PB84-163047; USGS/WRD/HD-84/003-Vol-1) Avail: NTIS HC A10/MF A01 CSCL 08H

Water-resources data for the 1982 water year for Minnesota consist of records of stage, discharge and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. Discharge records for 47 gaging stations; stage-only records for 1 gaging station; stage and contents for 5 lakes and reservoirs; water quality for 15 gaging stations, 2 stage stations, 20 partial-record stations, and 5 wells; and water levels for 47 observation wells are given. Also included are 43 high-flow partial-record stations. Author (GRA)

N84-24008# Geological Survey, St. Paul, Minn. Water Resources Div.
WATER RESOURCES DATA FOR MINNESOTA WATER YEAR, 1982. VOLUME 2: UPPER MISSISSIPPI AND MISSOURI RIVER BASINS Annual Water-Resources Investigations, 1 Oct. 1981 - 30 Sep, 1982
K. T. Gunard, J. H. Hess, J. L. Zirbel, and C. E. Cornelius Oct. 1983 465 p refs
(PB84-163054; USGS/WRD/HD-84/004-Vol-2; USGS/WRD/MN-82/2-Vol-2) Avail: NTIS HC A20/MF A01 CSCL 08H

Water resources data for the 1982 water year for Minnesota consists of records of stage, discharge and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. This volume contains discharge records for 83 gaging stations; stage and contents for 9 lakes and reservoirs; water quality for 27 stream stations, 19 partial-record stations, 1 precipitation station, and 63 wells; and water levels for 238 observation wells. Also included are 108 high-flow partial-record stations. GRA

N84-23935# Geological Survey, Washington, D. C.
ANTARCTIC MAPPING AND INTERNATIONAL COORDINATION Abstract Only
Rupert B. Southard and William J. Kosco *In its* US Geological Survey Polar Res. Symp. 1983 p 1-2 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23936# Geological Survey, Washington, D. C.
CONFIGURATION OF EASTERN GONDWANALAND Abstract Only
Warren Hamilton *In its* US Geological Survey Polar Res. Symp. 1983 p 2-3 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23937# Geological Survey, Washington, D. C.
MINERAL RESOURCES OF ANTARCTICA Abstract Only
Peter D. Rowley, P. L. Williams, and D. E. Pride (Ohio State Univ., Columbus) *In its* US Geological Survey Polar Res. Symp. 1983 p 3 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23938# Geological Survey, Washington, D. C.
SPECULATIONS ON THE PETROLEUM RESOURCES OF ANTARCTICA Abstract Only
John C. Behrendt and Charles D. Masters *In its* US Geological Survey Polar Res. Symp. 1983 p 3-4 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23940# Geological Survey, Washington, D. C.
SATELLITE IMAGE ATLAS OF GLACIERS: THE POLAR

REGIONS Abstract Only
Richard S. Williams, Jr. and Jane G. Ferrigno *In its* US Geological Survey Polar Res. Symp. 1983 p 5 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23943# Geological Survey, Washington, D. C.
THE DUFFEK INTRUSION OF ANTARCTICA AND A SURVEY OF ITS MINOR METALS RELATED TO POSSIBLE RESOURCES
Arthur B. Ford *In its* US Geological Survey Polar Res. Symp. 1983 p 7-10 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23954# Geological Survey, Washington, D. C.
PROGRAM FOR MAPPING ANTARCTICA Abstract Only
Peter F. Bermel and Charles E. Morrison *In its* US Geological Survey Polar Res. Symp., Abstracts with Program 1983 p 18-19 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23957# Geological Survey, Washington, D. C.
MODELING THE MOVEMENT AT THE POLAR ICE CAP AT THE SOUTH POLE Abstract Only
Thomas Henderson *In its* US Geological Survey Polar Res. Symp. 1983 p 21 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23960# Geological Survey, Washington, D. C.
OIL AND GAS RESOURCES OF THE NORTH SLOPE, ALASKA
Kenneth J. Bird *In its* US Geological Survey Polar Res. Symp. 1983 p 27-30 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23961# Geological Survey, Washington, D. C.
PETROLEUM SOURCE ROCK RICHNESS, TYPE AND MATURITY FOR FOUR ROCK UNITS ON THE ALASKAN NORTH SLOPE: ARE THEY SOURCES FOR THE TWO OIL TYPES? Abstract Only
Leslie B. Magoon and George E. Claypool *In its* US Geological Survey Polar Res. Symp. 1983 p 30-31 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23962# Geological Survey, Washington, D. C.
EMERGING RECOGNITION OF THE NONFUEL MINERAL RESOURCES OF ARCTIC ALASKA Abstract Only
Donald Grybeck *In its* US Geological Survey Polar Res. Symp. 1983 p 31-32 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23963# Geological Survey, Washington, D. C.
COAL OCCURRENCE, QUALITY AND RESOURCE ASSESSMENT, NATIONAL PETROLEUM RESERVE IN ALASKA
Gary D. Stricker *In its* US Geological Survey Polar Res. Symp. 1983 p 32-33 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23971# Technicolor Government Services, Inc., Moffett Field, Calif.
LAND COVER AND TERRAIN MAPPING FOR THE DEVELOPMENT OF DIGITAL DATA BASES FOR WILDLIFE HABITAT ASSESSMENT IN THE YUKON FLATS NATIONAL WILDLIFE REFUGE, ALASKA
Mark B. Shasby, Carl Markon (US Fish and Wildlife Service), Michael D. Fleming, Dennis L. Murphy, and James E. York *In* Geological Survey US Geological Survey Polar Res. Symp. 1983 p 43 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23972# Geological Survey, Washington, D. C.
GEOCHEMICAL DETECTION OF PROSPECTIVE PETROLEUM AREAS IN ARCTIC REGIONS Abstract Only
A. A. Roberts, T. J. Donovan, J. D. Hendricks, and K. I. Cunningham *In its* US Geological Survey Polar Res. Symp. 1983 p 43 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23973# Geological Survey, Washington, D. C.
HYDROLOGY OF THE NORTH SLOPE, ALASKA Abstract Only
Charles E. Sloan *In its* US Geological Survey Polar Res. Symp. 1983 p 44 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N84-24009# Naval Civil Engineering Lab., Port Hueneme, Calif.
THERMAL ENERGY RECOVERY IN GAS TURBINE ENGINE TEST CELLS Final Report, Oct. 1982 - Sep. 1983
C. A. Kodres Nov. 1983 112 p
(ONR Proj. Z08-29)
(AD-A139457; NCEL-TN-1679) Avail: NTIS HC A06/MF A01 CSCL 10/1

The economics of thermal energy recovery in jet engine test cells is examined. A numerical model to simulate the test cell augmenter tube is developed. This model is employed to determine the feasibility of installing heat exchangers along the augmenter or at the augmenter exit and using these heat exchangers to generate steam or electricity from the thermal energy in the jet exhaust. In general, energy recovery is not practical. The exhaust is quickly diluted by the entrained augmentation air, decreasing temperature gradients necessary for heat transfer. Most test cells are used too infrequently to warrant the cost of the hardware.
Author (GRA)

N84-24010# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
ACHIEVEMENTS AND PLANS OF THE SOLAR THERMAL ADVANCED RESEARCH CENTER Technical Status Report, 1 Sep. - 30 Nov. 1983
Robert A. Cassanova 15 Dec. 1983 12 p
(Contract DE-AC03-81SF-11558)
(DE84-005480; DOE/SF-11558/T5) Avail: NTIS HC A02/MF A01

The achievements are outlined for the following tasks: (1) identification of potential window materials which are currently beyond the state of the art; (2) evaluate commercially available refractory coating materials; (3) modeling of materials for service life and failure prediction; (4) surface temperature and optical property measurement; (5) design and construction of entrainment reactor; and (6) program management.
DOE

N84-24011# Department of Energy, Washington, D. C. Office of Energy Systems Research.
ACTIVITIES OF THE HYDROGEN ENERGY COORDINATING COMMITTEE: SUMMARY OF DOE HYDROGEN PROGRAMS FOR FY 1983 Annual Report
Jan. 1984 36 p refs
(DE84-007016; DOE/CE-0034/2) Avail: NTIS HC A03/MF A01

Basic research into various production processes and storage methods is reviewed. An overview of the hydrogen related programs of the DOE offices represented on the HECC are reported. A historical summary of the hydrogen budgets of these offices is tabulated. Another table provides the distribution by program

element for FY 1983. Total DOE funding in FY 1983 for hydrogen reseach was $26.5 million. The individial program elements are described and more specific program information is given in the technology summary which are appended. DOE

N84-24012# Varian Associates, Palo Alto, Calif. Solid State Lab.
DEVELOPMENT OF HIGH-EFFICIENCY CONCENTRATOR CELL CONFIGURATION Final Report
P. G. Borden Feb. 1984 70 p refs
(Contract DE-AC04-76DP-00789)
(DE84-008356; SAND-83-7459) Avail: NTIS HC A04/MF A01

Development of a reflective spectrum-splitting system is described. This system uses a high-bandgap cell with a reflective back contact to reflect below-bandgap light to a second cell with a lower bandgap. The report discusses system and cell design. It then describes a process for making a thick, glass-bonded high-bandgap cell with a back surface reflector, appropriate for this application. DOE

N84-24013# Rockwell International Corp., Golden, Colo.
ROCKY FLATS WIND ENERGY RESEARCH CENTER, FISCAL YEAR 1982 Annual Report
Apr. 1983 68 p refs
(Contract DE-AC04-76DP-03533)
(DE84-006829; RFP-3612) Avail: NTIS HC A04/MF A01

The technical and management support for the research and testing of small wind systems designed primarily for residential, farm, and industrial use is described. The program objectives are described, the approach to achieving these objectives is defined, the management structure for program accomplishment is presented, and the technical progress during the fiscal year is described. The three main program elements are analytical model development and validation, research for integrated system design, and technology research and analysis. DOE

N84-24014# Rockwell International Corp., Golden, Colo. Energy Systems Group.
SMALL WIND SYSTEMS (FIELD EVALUATION). VOLUME 4: SMALL WIND SYSTEM PERFORMANCE DATA Final Report
J. M. Sherman, D. M. Dodge, and W. S. Bollmeier Jul. 1983 154 p refs 4 Vol.
(Contract DE-AC04-76DP-03533)
(DE84-006920; RFP-3562/4-Vol-4) Avail: NTIS HC A08/MF A01

The operation, management, and results of the Field Evaluation Program (FEP) for small wind systems, is described. The FEP was initiated in early 1979 with the overall objective of installing wind systems in the states and territories (including those in the Pacific Basin) to assist local governments in evaluating and addressing the institutional concerns associated with the proliferation of small wind systems in utility interconnected applications. The report is presented in four volumes. In Volume 4 the data collection and analysis procedures followed during the FEP are described and performance data summaries are presented for each of the 38 sites. None of the FEP wind systems installed at good wind sites approached the expected energy output and, in aggregate, the machines produced about hallf the energy expected. The mean capacity factor for machines at sites with average winds of 4.5 m/s or greater was .10. Mean times between failures for three wind system models varied from 85 to 187 days. The poor performance of the FEP machines indicated that the technology required major improvement. DOE

N84-24015# Arizona State Univ., Tempe. Dept. of Chemistry.
ENHANCED SOLAR ENERGY COLLECTION IN PORPHYRIN BASED PHOTOCONVERSION SCHEMES Final Technical Report
D. Gust and T. A. Moore Feb. 1983 35 p refs
(Contract DE-FG02-79ER-10545)
(DE84-006882; DOE/ER-10545/1) Avail: NTIS HC A03/MF A01

A series of carotenoporphyrins whose conformations varied from folded (with the carotenoid (PI)-electron system stacked over that of the porphyrin) to extended (with the two chromophores widely separated) were studied. The conformations were determined by high resolution proton NMR studies. Laser flash spectroscopy revealed triplet energy transfer from porphyrin to carotenoid. Three distinct pathways for such transfer were discovered: (1) static through space transfer which does not require significant intramolecular motions; (2) dynamic through space transfer mediated by intramolecular motions; (3) triplet transfer mediated by the chemical bonds joining the chromophores. pulse radiolysis and fluorescence quenching of these ethers and related carotenoporphyrins revealed electron transfer in the systems. It is demonstrated that the natural carotenoid functions of photoprotection from singlet oxygen damage and antenna function can be mimicked by synthetic molecules, and therefore, in principle can be applied to artificial solar energy conversion systems. DOE

N84-24016# Dunn Geoscience Corp., Latham, N.Y.
EXPLORATION AND DRILLING FOR GEOTHERMAL HEAT IN THE CAPITAL DISTRICT, NEW YORK Final Report
Margaret R. Sneeringer, W. Konrad Crist, and James R. Dunn Aug. 1983 178 p refs Sponsored in part by DOE
(PB84-153162; NYERDA-83-5) Avail: NTIS HC A09/MF A01 CSCL 08G

The Capital District area of New York was explored to determine the nature of a hydrothermal geothermal system. The chemistry of sub-surface water and gas, the variation in gravity, magnetism, seismicity, and temperature gradient measurements indicate the existence of a geothermal system located under an area from Ballston Spa, southward to Altamont, and eastward toward Albany. Eight wells about 400-feet deep, one 600-foot well and one 2232-foot well were drilled and tested for geothermal potential. The highest temperature gradients, most unusual water chemistries, and greatest carbon dioxide exhalations were observed in the vicinity of the Saratoga and McGregor faults between Saratoga Springs and Schenectady, suggesting some fault control over the geothermal system. Depths to the warm fluids within the system range from 500 meters (Ballston Spa) to 2 kilometers (Albany).
Author (GRA)

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N84-24017# Atmospheric Physics, Inc., Peralta, N. Mex.
THE TRANSFER FUNCTION MODEL: A COMPUTER PROGRAM FOR DETERMINATION OF JET ENGINE TEST CELL EXHAUST PARTICULATES AND OPACITY Final Report, Mar. - Sep. 1983
C. Richards Feb. 1984 14035 p
(Contract N66001-83-C-0237)
(AD-A139222; NOSC-CR-224) Avail: NTIS HC A03/MF A01 CSCL 21/2

The Transfer Function Model (TFM) is an extensive computer program which is capable of computing the downstream parameters of a jet engine exhaust plume for generalized initial conditions, duct system geometry, and liquid and/or gas dilution. For example, the TFM can be used to predict the opacity of a plume at any distance from the engine exhaust plane, or the change in opacity as the engine load is changed. More specifically, the following parameters of the exhaust plume can be calculated by the TFM at any arbitrary point downstream from the jet exhaust plane: (1) Particulate size distribution, (2) Gas temperature, (3) Gas density (and water vapor density), (4) Gas velocity, (5) Droplet size distribution (if condensation has occurred or if water has been injected), (6) Light scattered and absorbed by each of the various sized particulates, and (7) Total plume opacity. Author (GRA)

N84-24018# Research Triangle Inst., Research Triangle Park, N.C.
TECHNOLOGY TRANSFER OF THE AIR QUALITY ASSESS-

MENT MODEL Final Report, Dec. 1981 - Jul. 1983
J. G. Haidt, D. D. Berlinrut, E. W. Artiglia, and G. D. Seitchek
Tyndall AFB, Fla. AFESC Feb. 1984 72 p
(Contract F33615-80-D-4000; AF Proj. 2054)
(AD-A139582; AFESC/ESL-TR-83-40) Avail: NTIS HC A04/MF A01 CSCL 09/2

Air Quality Assessment Model (AQAM) is used by the Air Force to estimate and predict present and future local air pollution concentrations resulting from onbase activities. Every major air pollution source on an airbase is accounted for by AQAM. AQAM originally existed in a format compatible with the computers of the Air Force Engineering and Services Center (AFESC). Upon completion of AQAM prototype development, technology transfer to the USAF Occupational and Environmental Health Laboratory (USAF OEHL) for field application began. This project involved making all necessary installations, tests, modification and evaluations to make the model compatible with USAF OEHL computers. This report describes the AQAM model and the required modifications for the USAF OEHL computers. New subroutines and changes to the original subroutines are documented. Information on data preparation, processing, and display is provided for the operator. Author (GRA)

N84-24019# GKSS-Forschungszentrum Geesthacht (West Germany). Inst. fuer Physik.
PARAMETRIZATION OF THE TURBULENT DIFFUSION IN THE ATMOSPHERE USING THE TURBULENT ENERGY EQUATION(S) Thesis - Tech. Univ., Hamburg [PARAMETRISIERUNG DER TURBULENTEN DIFFUSION IN DER ATMOSPHAERE UNTER BENUTZUNG DER TURBULENTEN ENERGIEGLEICHUNG(EN)]
M. Lautenschlager 1983 111 p refs In GERMAN; ENGLISH summary
(GKSS-83-E-60; ISSN-0344-9629) Avail: NTIS HC A06/MF A01

The turbulent diffusion of pollutants was studied. The turbulent diffusion is represented by the turbulent kinetic energy and a turbulent time scale. The horizontal and vertical turbulent exchange coefficients are determined. The turbulent energies are calculated by partial differential equations. The Crank-Nicolson method is used for time integration. The turbulent time scales are determined by fitting the results of propagation experiments.
Author (ESA)

N84-24020# Joint Publications Research Service, Arlington, Va.
EAST EUROPE REPORT: SCIENTIFIC AFFAIRS
8 Mar. 1984 33 p refs Transl. into ENGLISH from various East European articles
(JPRS-ESA-84-008) Avail: NTIS HC A03/MF A01

Studies are done on the presence of radiation in the atmosphere. Results are given and radiation concentrations are measured. For individual titles, see N84-24021 through N84-24023.

N84-24021# Joint Publications Research Service, Arlington, Va.
ARTICLE EXAMINES PRESENCE OF KR-85 IN ATMOSPHERE
Eva Csongor *In its* East Europe Rept.: Sci. Affairs (JPRS-ESA-84-008) 8 Mar. 1984 p 1-6 refs Transl. into ENGLISH from Fiz. Szemle (Budapest), no. 2, Feb. 1969 p 33-35 (For primary document see N84-24020 14-45)
Avail: NTIS HC A03/MF A01

The radioactivity of the atmosphere has increased gradually in the past 15 years as a result of human activity as artificial radioactive materials get into the atmosphere as a result of fission and fusion processes. The noble gases arising during fission represent an exception; they do not form compounds in the atmosphere and do not adhere to dust particles. The noble gas isotopes are given with half lives longer than one hour arising in the fission of various heavy nuclei and their fission yields in percent. During fission there arise 16 isotopes of Kr and 20 isotopes of Xe; of these 10 are stable, the rest decay with short or very short half lives; the only exception is Kr-85, the half life of which is 10.76 years. The Kr-85 arising during nuclear weapon experiments gets into the atmosphere. The purpose of this study was to measure the Kr-85 content in the atmosphere. B.W.

N84-24022# Joint Publications Research Service, Arlington, Va.
MEASUREMENTS CONCERNING INCREASE OF ATMOSPHERIC RADIOKRYPTON CONTENT
Eva Csongor *In its* East Europe Rept.: Sci. Affairs (JPRS-ESA-84-008) 8 Mar. 1984 p 7-16 refs Transl. into ENGLISH from Izoptech. (Budapest), no. 2, 1973 p 96-103 (For primary document see N84-24020 14-45)
Avail: NTIS HC A03/MF A01

Measurements to detect increase in radiokrypton content in the atmosphere were taken. Methods of measurement and problems encountered are outlined in this report. Author

N84-24023# Joint Publications Research Service, Arlington, Va.
MEASUREMENTS OF ATMOSPHERIC KR-85 CONCENTRATION AT ATOMKI FROM 1966 TO 1977
Eva Csongor *In its* East Europe Rept.: Sci. Affairs (JPRS-ESA-84-008) 8 Mar. 1984 p 17-29 refs Transl. into ENGLISH from Atomki Kozlemenyek (Budapest), no. 21, 1979 p 1-12 (For primary document see N84-24020 14-45)
Avail: NTIS HC A03/MF A01

The author first provides a review of the various methods used thus far to measure the Kr-86 concentration and of enrichment and measurement procedures. Measurements done regularly at ATOMKI since 1966 are described. B.W.

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N84-24024# Danish Meteorological Inst., Copenhagen. Geofysisk Afdeling.
THE GEOMAGNETIC ELEMENTS IN DENMARK 1928-1980
H. A. Hansen 1983 161 p refs
(ISBN-87-7478-219-3) Avail: NTIS HC A08/MF A01

Geomagnetic surveys in Denmark from 1928 till 1980 are reported. The Danish Meteorological Institute initiated a new, geomagnetic survey of Denmark in 1928 by the establishment of 10 repeat statins for observation of the geomagnetic, secular variation. The stations were visited again in 1930 and since then every fifth year. The general survey was started in 1939 and continued during the years 1946 to 1957 with the mapping of Northern Jutland. In 1967 the survey taken with a coarser spacing of the measured points during the following years succeeded in completing the mapping of the country with primary consideration to the declination. The observations on the repeat stations during the time 1928-1980 allowed development of mathematical formulas for the secular change of the magnetic elements D, H and Z at any arbitrary point in the country. E.A.K.

N84-24025# Geological Survey, Washington, D. C.
SUMMARY OF WORKSHOPS CONCERNING REGIONAL SEISMIC SOURCE ZONES OF PARTS OF THE CONTERMINOUS UNITED STATES CONVENED BY THE US GEOLOGICAL SURVEY 1979 - 1980, GOLDEN, COLORADO
Paul C. Thenhaus, ed. 1983 40 p refs
(USGS-Circ-898) Avail: NTIS HC A03/MF A01

Workshops were convened by the U.S. Geological Survey to obtain the latest information and concepts relative to defining seismic source zones for five regions of the United States. The zones, with some modifications, have been used in preparation of new national probabilistic ground motion hazard maps by the U.S. Geological Survey. The five regions addressed are the Great Basin, the Northern Rocky Mountains, the Southern Rocky Mountains, the Central Interior, and the northeastern United States. Discussions at the workshops focussed on possible temporal and spatial variations of seismicity within the regions, latest ages of surface-

fault displacements, most recent uplift or subsidence, geologic structural provinces as they relate to seismicity, and speculation on earthquake causes. B.W.

N84-24026# Geological Survey, Washington, D. C.
EARTHQUAKES IN THE UNITED STATES, APRIL - JUNE 1982
B. G. Reagor, C. W. Stover, J. H. Minsch, and L. R. Brewer 1983 33 p
(USGS-Circ-896-B) Avail: NTIS HC A03/MF A01

The purpose of this circular is to provide a complete listing of macroseismic effects of earthquakes, which can be used in risk studies, nuclear power plant site evaluations, seismicity studies, and to answer inquiries by the public. This publication contains two major sections. The first part which is mainly concerned with data obtained by seismographs, is a tabular listing of earthquakes in chronological order by State, consisting of the following basic information: date, origin time, hypocenter, magnitude, maximum intensity, and computational source of the hypocenter. The second section, which concerns intensity information, consists of isoseismal or intensity maps. This section may contain information on events that were felt but were not listed in the PDE because there was not enough instrumental data to obtain a solution. B.W.

N84-24027# Geological Survey, Washington, D. C.
A REVIEW OF CLASSICAL SILICATE-ROCK ANALYSIS AND RECOMMENDED MODIFICATIONS OF CLASSICAL METHODS OF ANALYSIS
Lillie B. Jenkins 1983 38 p refs
(USGS-Circ-864) Avail: NTIS HC A03/MF A01

This work was undertaken to review current classical chemical methods, to define existing problems, and to suggest modifications to improve the accuracy and precision of classical chemistry. Problems that may arise in the analysis of silicate rocks are discussed, and detailed procedures are given for the determination of 13 constituents commonly present in silicate rocks. The method for the determination of water is a simplification of the Penfield method and includes some modifications made by other authors. The detailed description of the method can easily be followed by inexperienced chemists who can thus obtain very accurate results. A detailed discussion of the sample blank is given. The blank and the standard sample are used as controls for the analysis. Many possible errors that could be made in the determination of silica and that would lead to errors in the remaining determinations are presented, and precise directions are given on how to avoid these errors. B.W.

N84-24028# Geological Survey, Menlo Park, Calif.
STRONG MOTION PROGRAM REPORT Report, Jan. - Dec. 1981
Ronald L. Porcella, ed. 1983 25 p refs
(USGS-Circ-914; LC-83-600616) Avail: NTIS HC A02/MF A01

Preliminary information is given on the nature and availability of strong-motion data recorded by the U.S. Geological Survey (USGS). A summary of USGS strong-motion data recorded during the Westmorland, California, earthquake of April 26, 1981, and a revision of strong-motion data recorded during the Livermore, California, earthquakes of January 24 and 26, 1980, are included along with summaries of recent strong-motion reports, notes on the availability of digitized data, and additional general information related to the USGS and to other strong-motion programs. A tabulated data summary contains information on those accelerograms recovered (although not necessarily recorded) during 1981. A.R.H.

N84-24029*# Gulton Industries, Inc., Albuquerque, N.Mex. Data Systems Div.
NIMBUS-EARTH RADIATION BUDGET INSTRUMENT ANALYSIS
R. M. Maschhoff May 1984 96 p refs
(Contract NAS1-16468)
(NASA-CR-172318; NAS 1.26:172318) Avail: NTIS HC A05/MF A01 CSCL 04A

The Wide Field Of View (WFOV) Earth Flux Channels of the Nimbus Earth Radiation Budget (ERB) instrument are studied with the objective of improving the understanding and confidence in the data. Laboratory tests on flight space Earth flux subassemblies followed by a set of in flight verification procedures are examined to see if the laboratory derived correction factors produced consistent results. Intercomparisons between the WFOV data and integrated scanner data as well as other truth are used in these verificaton procedures. The main source of errors are temperature and temperature gradient related offsets. The findings led to construction of a model for the short wave WFOV channel which use instrument temperatures and temperature differences to predict or establish offsets which need to be applied to data reduction algorithms for maximum final data product accuracy. M.A.C.

N84-24030*# Lunar and Planetary Inst., Houston, Tex.
GEOPHYSICAL INVESTIGATIONS OF A GEOTHERMAL ANOMALY AT WADI GHADIR, EASTERN EGYPT
P. Morgan, F. K. Boulos (Egyptian Geological Survey and Mining Authority, Cairo), S. F. Hennin (Egyptian Geological Survey and Mining Authority, Cairo), A. A. El-Sherif (Egyptian Geological Survey and Mining Authority, Cairo), A. A. El-Sayed (Egyptian Geological Survey and Mining Authority, Cairo), N. Z. Basta (Egyptian Geological Survey and Mining Authority, Cairo), and Y. S. Melek (Egyptian Geological Survey and Mining Authority, Cairo) [1984] 32 p refs
(Contract NASw-3389)
(NASA-CR-173527; NAS 1.26:173527; LPI-Contrib-446) Avail: NTIS HC A03/MF A01 CSCL 08G

During regional heat flow studies a geothermal anomaly was discovered approximately 2 km from the Red Sea coast at Wadi Ghadir, in the Red Sea Hills of Eastern Egypt. A temperature gradient of 55 C/km was measured in a 150 m drillhole at this location, indicating a heat flow of approximately 175 mw/sqm, approximately four times the regional background heat flow for Egypt. Gravity and magnetic data were collected along Wadi Ghadir, and combined with offshore gravity data, to investigate the source of the thermal anomaly. Magnetic anomalies in the profile do not coincide with the thermal anomaly, but were observed to correlate with outcrops of basic rocks. Other regional heat flow and gravity data indicate that the transition from continental to oceanic type lithosphere occurs close to the Red Sea margin, and that the regional thermal anomaly is possibly related to the formation of the Red Sea. Author

N84-24031*# National Aeronautics and Space Administration, Washington, D. C.
DISCUSSION OF THE DESIGN OF SATELLITE-LASER MEASUREMENT STATIONS IN THE EASTERN MEDITERRANEAN UNDER THE GEOLOGICAL ASPECT. CONTRIBUTION TO THE EARTHQUAKE PREDICTION RESEARCH BY THE WEGENER GROUP AND TO NASA'S CRUSTAL DYNAMICS PROJECT
A. Paluska and N. Pavoni Nov. 1983 18 p Transl. into ENGLISH of "Erlaeuterung zum Entwurf der Satelliten-Laser-Messtationen (SLR) im Oestlichen Mittelmeerraum aus Geologischer Sicht; Beitrag zur Erdbebenvorhersageforschung der Wegener Gruppe und zum Crustal Dynamics Project der NASA" rept. (West Germany), Aug. 1983 p 1-17 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77412; NAS 1.15:77412) Avail: NTIS HC A02/MF A01 CSCL 08G

Research conducted for determining the location of stations for measuring crustal dynamics and predicting earthquakes is discussed. Procedural aspects, the extraregional kinematic tendencies, and regional tectonic deformation mechanisms are described. Author

N84-24032# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
ELECTRON ENERGY DEPOSITION IN THE MIDDLE ATMOSPHERE
A. L. Vampola and D. J. Gorney 5 Dec. 1983 36 p

(Contract F04701-83-C-0084; Grant NSF ATM-77-28187)
(AD-A139122; TR-0084(4940-05)-5; SD-TR-83-79) Avail: NTIS HC A03/MF A01 CSCL 04/1

Spectra of locally precipitating 36 to 317 keV electrons obtained by instrumentation on the S3-2 satellite are used to calculate energy deposition profiles as a function of latitude, longitude, and altitude. In the 70 - 90 km altitude, midlatitude ionization due to these precipitating energetic electrons can be comparable to that due to direct solar H Lyman alpha. At night, the electrons produce ionization more than an order of magnitude greater than that expected from scattered H Lyman alpha. Maximum precipitation rates in the region of the South Atlantic Anomaly are on the order of 1/100 erg/sw cm-sec with a spectrum of the form j(E) = 134000 x 1/E + 2.27 power (keV). Southern Hemisphere precipitation dominates that in the north for 1.1 < L 6 except for regions of low local surface field in the Northern Hemisphere. Above L = 6, local time effects dominates; i.e., longitudinal effects due to the asymmetric magnetic field which are strong features below L = 6 disappear and are replaced by high-latitude precipitation events which are local-time features. Author (GRA)

N84-24033# National Telecommunications and Information Administration, Boulder, Colo. Inst. for Telecommunication Sciences.
AN ATMOSPHERIC MILLIMETER WAVE PROPAGATION MODEL Final Report, 1 Aug. 1979 - 31 Dec. 1983
H. J. Liebe Dec. 1983 118 p
(Contracts MIPR-30-79; MIPR-42-80; MIPR-51-81; MIPR-6-82; MIPR-101-83)
(AD-A139154; NTIA-83-137; ARO-16638.22-GS) Avail: NTIS HC A06/MF A01 CSCL 04/1

The neutral atmosphere is characterized for the frequency range from 1 to 300 GHz as a nonturbulent propagation medium. Attenuation and propagation delay effects are predicted from meteorological data sets: pressure, temperature, humidity, suspended particle concentration, and rain rate. The physical data base of the propagation model consists of four terms: (1) resonance information for 30 water vapor and 48 oxygen absorption lines in the form of intensity coefficients and center frequency for each line; (2) a composite (oxygen, water vapor, and nitrogen) continuum spectrum; (3) a hydrosol attenuation term for haze, fog, and cloud conditions; and (4) a rain attenuation model. Oxygen lines extend into the mesosphere, where they behave in a complicated manner due to the Zeeman effect. The geomagnetic field strength H is required as an additional input parameter. Each O2 line splits proportionally with H into numerous sub-lines, which are juxtaposed to form a Zeeman pattern spread over a megahertz scale. Patterns for three main polarization cases are calculated. Detailed examples for model atmosphere provide basic millimeter wave propagation information over the height range 0 to 100 km of the neutral atmosphere. Author (GRA)

N84-24034# Science Applications, Inc., McLean, Va.
ACTIVE IONOSPHERIC GENERATION ON ELF/VLF WAVES Final Report, 23 Oct. 1982 - 22 Dec. 1983
K. Papadopoulos, C. Chang, and K. Ko 9 Jan. 1984 31 p
(Contract N00014-83-C-2019)
(AD-A139317; SAI-84/1029) Avail: NTIS HC A03/MF A01 CSCL 04/1

Our work during the past year on active ELF/VLF generation has produced major breakthroughs in the understanding of nonlinear interactions in a dissipating medium such as the ionosphere for the purpose of downconverting H.F. to ELF/VLF waves. A key result was the fact that the contrary to the conventional understanding of such processes, the presence of a dissipative medium lowers the threshold for complete decay and increases the downconversion efficiency over the one expected on the basis of the Manley rowe relations. Two codes were developed and optimized. The first code named CMPOWER is required as an input a model of the ionospheric electron density and magnetic field, and the transmitter characteristics. It's output is the ELF/VLF signal as a function of the modulation frequency and distance from the HF facility. The second named TWC (three wave coupling) is a nonlinear code, which includes dissipation and finite pump size effects. Author (GRA)

N84-24035# Lincoln Lab., Mass. Inst. of Tech., Lexington.
PANORAMIC SKY MONITOR (PANSKY)
A. J. Wardrop 13 Jan. 1984 59 p
(Contract F19628-80-C-0002; AF Proj. 2698; AF Proj. 2295)
(AD-A139440; ETS-68; ESD-TR-83-110) Avail: NTIS HC A04/MF A01 CSCL 04/1

A system has been designed and built for optically detecting clouds at night. Based on a low light level television camera with a fisheye lens, the system can detect clouds either by moonlight or by stellar occultation. The system is integrated with a scheduling program for the Experimental Test System (ETS) of the Ground-Based Electro-Optical Deep Space Surveillance (GEODSS) system to allow operations on partly cloudy nights. Author (GRA)

N84-24036# Sierra Geophysics, Inc., Redmond, Wash.
DETERMINATION OF STRONG GROUND MOTION IN COMPLEX STRUCTURES USING DYNAMIC RAYTRACING Final Report, Apr. 1981 - Mar. 1983
G. R. Mellman, D. M. Hadley, R. S. Hart, and S. K. Kaufman Aug. 1983 77 p
(Contract F19628-81-C-0044; AF Proj. 2309)
(AD-A138559; SGI-R-83-096; AFGL-TR-83-0268) Avail: NTIS HC A05/MF A01 CSCL 08/11

This report describes the theoretical basis for the elastic three-dimensional raytracing program DYNARAY. Assumptions and model restrictions are discussed, and several methods for computation of travel times and amplitudes are presented. Results of modeling studies of ground motion for a realistic basin structure are also presented. These studies indicate that relatively strong amplification effects can occur, at points dependent upon both basin geometry and source location. Author (GRA)

N84-24037# Los Alamos Scientific Lab., N. Mex.
THREE-DIMENSIONAL COMPUTER MODELING OF DYNAMIC RECONNECTION IN THE MEGNETOTAIL
Joachim Birn 1983 42 p refs Presented at the Chapman Conf. on Magnetic Reconnection, Los Alamos, N.Mex., 3-7 Oct. 1983
(Contract W-7405-eng-36)
(DE84-007480; LA-UR-84-729; CONF-8310229-8) Avail: NTIS HC A03/MF A01

Two and three dimensional computer models of the dynamics of the magnetosphere and in particular the magnetotail have shown, that the basic features of the idealized linear or steady state reconnection theory are still found in time dependent and spatially more complicated configurations such as the magnetototail, which basically resembles a plane sheet pinch but in addition has small magnetic field components perpendicular to the sheet, field line flaring and variations along both directions parallel to the current sheet. These basic features are the formation of a magnetic neutral x-line or separator, where two surfaces separating magnetic fluxes of different topology intersect, with the generation of an electric field along the separator and the production of strong plasma flows parallel to the current sheet away from the separator in opposite directions. In addition, the computer models of magnetotail dynamics have produced many large scale features that are directly observed or deduced from observation in relation with magnetospheric substorms. Among those features are: the thinning of the plasma sheet, the formation of a plasmoid, a region of closed magnetic loops detached from Earth, which moves tailward at a speed of several hundreds of km/sec, and the generation of field-aligned currents. DOE

N84-24038# National Academy of Sciences - National Research Council, Washington, D. C. Commission on Physical Sciences, Mathematics, and Resources.
TOWARD AN INTERNATIONAL GEOSPHERE-BIOSPHERE PROGRAM: A STUDY OF GLOBAL CHANGE
1983 94 p Workshop held at Woods Hole, Mass., 25-29 Jul. 1983
(PB84-161769) Avail: NTIS HC A05/MF A01 CSCL 08G

The connections between the Earth geosphere and biosphere are discussed. A cooperative interdisciplinary program in Earth sciences, on an international scale is proposed. GRA

N84-24039# National Oceanic and Atmospheric Administration, Washington, D. C. National Environmental Satellite, Data, and Information Serice.
NIMBUS-7 ERB (EARTH RADIATION BUDGET) SUB-TARGET RADIANCE TAPE (STRT) DATA BASE
L. L. Stowe and M. D. Fromm Dec. 1983 83 p refs
(PB84-149921; NOAA/TM-NESDIS-3; NOAA-84012503) Avail: NTIS HC A05/MF A01 CSCL 04A

The angular dependence of reflected solar and emitted terrestrial radiation were studied. The role of the Earth's surface characteristics and cloudiness in the angular variation of radiation was considered. A data was complied that makes available from one source, detailed information describing the Earth's surface configuration and vegetation, snow and ice cover, cloud cover and type, and long and short wave radiance at the top of the atmosphere. The data is archived on magnetic tape, which will be referred to as the sub target radiance tape (STRT). The data base is global in coverage and offers daily resolution for 272 days. The STRT physical product, the methods used to create each component of the data base are described. GRA

N84-24040# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
BETA: A PROGRAM FOR CALCULATING AND ARCHIVING BACKSCATTERING PROFILES TAKEN WITH THE NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION) COHERENT LIDAR SYSTEM
M. J. Post, J. F. Morrow, and D. B. Jensen Nov. 1983 50 p refs
(PB84-150168; NOAA-TM-ERL-WPL-113; NOAA-84012505) Avail: NTIS HC A03/MF A01 CSCL 04A

The interactive program BETA which provide users information about its purpose and its inputs and outputs was determined. Running the program and understanding the raw and processed data is emphasized. GRA

N84-24041# National Oceanic and Atmospheric Administration, Boulder, Colo. World Data Center A for Solar-Terrestrial Physics.
NUMERICAL MODELING OF IONOSPHERIC PARAMETERS FROM GLOBAL IMS (INTERNATIONAL MAGNETOSPHERIC STUDY) MAGNETOMETER DATA FOR THE CDAW-6 INTERVALS
Y. Kamide, H. W. Kroehl, B. A. Hausman, R. L. McPherron, and S. Akasofu Nov. 1983 208 p refs
(PB84-151307; UAG-88; NOAA-84012001) Avail: NTIS HC A10/MF A01 CSCL 04A

The results of modeling efforts to estimate the distribution of ionospheric electric potential, ionospheric and field-aligned currents, and Joule heating rate from ground-based magnetic records for two intervals are presented. They include: (1) 0700-1800 UT on March 22, 1979, and (2) 1200 UT on March 31 to 0600 UT on April 1, 1979. The global modeling study constitutes one of the major contributions to the coordinated data analysis workshop (CDAW-6). GRA

N84-24042# Environmental Protection Agency, Research Triangle Park, N.C. Environmental Sciences Research Lab.
ASSESSMENT OF OZONE AS A SURROGATE FOR OTHER PRODUCTS OF ATMOSPHERIC PHOTOCHEMICAL REACTIONS
A. P. Altshuller Aug. 1983 7 p
(PB84-155852; EPA-600/D-83-070) Avail: NTIS HC A02/MF A01 CSCL 04B

A summary of the extensive review and criterial analysis of the literature on products of atmospheric photochemical reactions in the lower troposphere, and an assessment of that body of research information is presented. The review is reported separately. The conclusions reached are as follows: (1) the products other than ozone and nitrogen dioxide in combination occur in ambient air at concentrations approaching or equalling the concentrations of ozone, (2) the other products show the same directional characteristics as ozone in ambient air (3) the quantitative relationships between these other products and ozone are complx and are different for each product, and (4) the quantitative relationships between these products and precursor hydrocarbons and nitrogen oxides are complex and are different for each product. GRA

N84-24043# Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
HEAT TRANSFER EFFECTS DURING COLD DENSE GAS DISPERSION Final Report, Aug. 1982 - Sep. 1983
G. Andreiev, D. E. Neff, and R. N. Meroney Nov. 1983 243 p refs Sponsored by Gas Research Inst.
(PB84-162999; CER83-84GA-DEN-RNM3; GRI-83/0022) Avail: NTIS HC A11/MF A01 CSCL 04A

Wind tunnel concentration data were obtained for continuous area releases of isothermal, cold N2, cold CO2 and cold CH4 clouds. Wind tunnel results were compared to field test results and to a computer model simulation. Heat transfer and humidity effects on model concentration distributions were significant for methane plumes when surface Richardson numbers, Ri, were large (i.e., low wind speed and high boiloff rates conditions). At field scales heat transfer and humidity still play a role in the dispersion of methane spill cases, but plume dilution and lift off are not as exaggerated as for the model cases. GRA

N84-23939# Geological Survey, Washington, D. C.
PLANNED MARINE GEOPHYSICAL GEOLOGICAL SURVEYS OF THE WILKES LAND AND ROSS SEA MARGINS Abstract Only
Stephen L. Eittreim *In its* US Geological Survey Polar Res. Symp. 1983 p 4-5 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23944# Geological Survey, Washington, D. C.
CRYSTALLIZATION OF THE DUFFEK INTRUSION, ANTARCTICA Abstract Only
Glen R. Himmelberg and Arthur B. Ford *In its* US Geological Survey Polar Res. Symp. 1983 p 10-11 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23945# Geological Survey, Washington, D. C.
GEOPHYSICAL INVESTIGATIONS OF THE DUFEK INTRUSION AND THE SURROUNDING REGION Abstract Only
John C. Behrendt *In* US Geological Survey Polar Res. Symp. 1983 p 11-12 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23946# Geological Survey, Washington, D. C.
GEOLOGY OF THE NEPTUNE RANGE, ANTARCTICA Abstract Only
Willis H. Nelson and Paul L. Williams *In its* US Geological Survey Polar Res. Symp. 1983 p 12 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23947# Geological Survey, Washington, D. C.
PROTEROZOIC TO MESOZOIC MOBILE-BELT GEOLOGY, PENSACOLA MOUNTAINS, ANTARCTICA Abstract Only
Dwight L. Schmidt *In its* US Geological Survey Polar Res. Symp. 1983 p 12-13 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23948# Geological Survey, Washington, D. C.
SEDIMENTOLOGY OF THE HORLICK FORMATION (LOWER DEVONIANS), OHIO RANGE, TRANSANTARCTIC MOUNTAINS Abstract Only
Lucy McCartan, Margaret A. Bradshaw (Canterbury Museum), and Graeme Ayers (Mount Cook National Park) *In its* US Geological Survey Polar Res. Symp. 1984 p 13-14 (For primary document

see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23949# Geological Survey, Washington, D. C.
SMALL-SCALE MAGNETIC FEATURES OF THE POLAR REGIONS
Joseph C. Cain and Dave Ray Schmitz *In its* US Geological Survey Polar Res. Symp. 1983 p 14-15 refs (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23950# Geological Survey, Washington, D. C.
PALEOMAGNETIC STUDIES IN ANTARCTICA Abstract Only
Richard L. Reynolds and Karl S. Kellogg *In* US Geological Survey Polar Res. Symp. 1983 p 15-16 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23951# Geological Survey, Washington, D. C.
MARS-ANALOG STUDIES IN WRIGHT AND VICTORIA VALLEYS, ANTARCTICA Abstract Only
E. C. Morris and H. E. Holt *In its* US Geological Survey Polar Res. Symp. 1983 p 17 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23952# Geological Survey, Washington, D. C.
AN ISOTOPIC AND CHEMICAL STUDY OF LAKE VANDA AND DON JUAN POND, ANTARCTICA Abstract Only
Irving Friedman, Athol Rafter (Inst. for Nuclear Studies), and George I. Smith *In its* US Geological Survey Polar Res. Symp. 1983 p 17-18 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23956# Geological Survey, Washington, D. C.
GLACOLOGICAL AND GEOLOGICAL STUDIES OF ANTARCTICA WITH SATELLITE REMOTE SENSING TECHNOLOGY Abstract Only
Jane G. Ferrigno, Richard S. Williams, Jr., C. Scott Southworth, and Tony K. Meunier *In its* US Geological Survey Polar Res. Symp. 1983 p 20-21 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23958# Geological Survey, Washington, D. C.
TECTONIC EVOLUTION OF THE ARCTIC CONTINENTAL MARGIN IN THE BEAUFORT AND CHUKCHI SEAS: EVIDENCE FROM SEISMIC REFLECTIONS Abstract Only
Arthur Grantz and S. D. May *In its* US Geological Survey Polar Res. Symp. 1983 p 23 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23959# Geological Survey, Washington, D. C.
THE ARCTIC PLATFORM IN THE NATIONAL PETROLEUM RESERVE IN ALASKA: DEPOSITION, DEFORMATION AND PETROLEUM POTENTIAL
C. E. Kirschner *In its* US Geological Survey Polar Res. Symp. 1983 p 24-27 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23964# Geological Survey, Washington, D. C.
PERMAFROST AND THE GEOTHERMAL REGIME Abstract Only
Arthur H. Lachenbruch and B. V. Marshall *In its* US Geological Survey Polar Res. Symp. 1983 p 33-34 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23965# Geological Survey, Washington, D. C.
GLACIATION IN ARCTIC ALASKA Abstract Only
Thomas D. Hamilton *In its* US Geological Survey Polar Res. Symp. 1983 p 34-36 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23966# Geological Survey, Washington, D. C.
A PLEISTOCENE SAND DESERT IN ARCTIC ALASKA Abstract Only
L. David Carter *In its* US Geological Survey Polar Res. Symp. 1983 p 36 refs (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23967# Geological Survey, Washington, D. C.
SEDIMENTARY FACIES ON AN ICE DOMINATED SHELF, BEAUFORT SEA, ALASKA Abstract Only
Peter W. Barnes and Erik Reimnitz *In its* US Geological Suvey Polar Res. Symp. 1983 p 37 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23968# Geological Survey, Washington, D. C.
QUATERNARY SEDIMENTATION ON THE ALASKAN BEAUFORT SHELF: SEDIMENT SOURCES, GLACIOEUSTATISM AND REGIONAL TECTONICS
David A. Dinter *In its* US Geological Survey Polar Res. Symp. 1983 p 37-38 refs (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N84-24044*# National Aeronautics and Space Administration, Washington, D. C.
A SPATIAL MODEL OF WIND SHEAR AND TURBULENCE FOR FLIGHT SIMULATION Ph.D. Thesis - Colorado State Univ.
C. Warren Campbell May 1984 131 p refs
(NASA-TP-2313; NAS 1.60:2313) Avail: NTIS HC A07/MF A01 CSCL 04B

A three dimensional model which combines measurements of wind shear in the real atmosphere with three dimensional Monte Carlo simulated turbulence was developed. The wind field over the body of an aircraft can be simulated and all aerodynamic loads and moments calculated. M.A.C.

N84-24045 Royal Netherlands Meteorological Inst., De Bilt.
WIND CLIMATE OF THE NETHERLANDS
J. Wieringa and P. J. Rijkoort 1983 265 p refs In DUTCH; ENGLISH summary
(ISBN-90-12-04466-9) Copyright. Avail: Issuing Activity

The Dutch suface wind climate based on hourly wind data in the period 1945 to 1980 from over 40 wind stations and 2 lightvessels is described. The instrumentation and evaluation procedures are reviewed. General physical relations between local wind climate, boundary layer stratification, and surface roughness are treated. Procedures for the analysis of station and wind data with regard to local sheltering and mesoscale terrain effects are presented. Data on the diurnal and annual course of the wind as a function of continentality are given. The statistical evaluation of wind data, e.g., to obtain extreme design wind speeds, is dealt with. Author (ESA)

N84-24046 Deutscher Wetterdienst, Offenbach am Main (West Germany).
REPORTS FROM THE GERMAN METEOROLOGICAL SERVICE. NO 21: THE EVOLUTION OF METEOROLOGICAL OBSERVATIONS IN AUSTRIA, INCLUDING BOHEMIA AND MORAVIA UP TO THE YEAR 1700 [DIE ENTWICKLUNG DER METEOROLOGISCHEN BEOBACHTUNGEN IN OESTERREICH EINSCHLIESSLICH BOEHMEN UND MAEHREN BIS ZUM JAHR 1700]
Fritz Klemm 1983 50 p refs In GERMAN
(ISBN-3-88148-208-3; ISSN-0072-4122) Copyright. Avail: Issuing Activity

The evolution of meteorological observations in the German

speaking part of Central Europe is presented. The year 1700 can be considered as a turning point in this evolution. The history of the observations in the different regions and stations is depicted and tables are given. Author (ESA)

N84-24047*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ATMOSPHERIC ENVIRONMENT FOR SPACE SHUTTLE (STS-9) LAUNCHE
D. L. Johnson, C. K. Hill, and G. W. Batts (Computer Sciences Corp.) Jan. 1984 42 p refs
(NASA-TM-82572; NAS 1.15:82572) Avail: NTIS HC A03/MF A01 CSCL 04B

This report presents a summary of selected atmospheric conditions observed near Space Shuttle STS-9 launch time on November 28, 1983, at Kennedy Space Center, Florida. Values of ambient pressure, temperature, moisture, ground winds, visual observations (cloud), and winds aloft are included. The sequence of prelaunch Jimsphere measured vertical wind profiles is given in this report. The final meteorological tape, which consists of wind and thermodynamic parameters versus altitude, for STS-9 vehicle ascent has been constructed. The STS-9 ascent meteorological data tape has been constructed by Marshall Space Flight Center in response to Shuttle task agreement No. 561-81-22-368 with Johnson Space Center. Author

N84-24048*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DOCUMENTATION OF THE GLAS FOURTH ORDER GENERAL CIRCULATION MODEL. VOLUME 1: MODEL DOCUMENTATION
E. Kalnay, R. Balgovind, W. Chao, J. Edelmann, J. Pfaendtner, L. Takacs, and K. Takano Dec. 1983 381 p refs 3 Vol.
(NASA-TM-86064-Vol-1; NAS 1.15:86064-Vol-1) Avail: NTIS HC A17/MF A01 CSCL 04B

The volume 1, of a 3 volume technical memoranda which contains a documentation of the GLAS Fourth Order General Circulation Model is presented. Volume 1 contains the documentation, description of the stratospheric/tropospheric extension, user's guide, climatological boundary data, and some climate simulation studies. E.A.K.

N84-24049*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DOCUMENTATION OF THE GLAS FOURTH ORDER GENERAL CIRCULATION MODEL. VOLUME 2: SCALAR CODE
E. Kalnay, R. Balgovind, W. Chao, D. Edelmann, J. Pfaendtner, L. Takacs, and K. Takano Dec. 1983 523 p 3 Vol.
(NASA-TM-86064-Vol-2; NAS 1.15:86064-Vol-2) Avail: NTIS HC A22/MF A01 CSCL 04B

Volume 2, of a 3 volume technical memoranda contains a detailed documentation of the GLAS fourth order general circulation model. Volume 2 contains the CYBER 205 scalar and vector codes of the model, list of variables, and cross references. A variable name dictionary for the scalar code, and code listings are outlined. E.A.K.

N84-24050*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DOCUMENTATION OF THE GLAS FOURTH ORDER GENERAL CALCULATION MODEL. VOLUME 3: VECTORIZED CODE FOR THE CYBER 205
E. Kalnay, R. Balgovind, W. Chao, D. Edelmann, J. Pfaendtner, L. Takacs, and K. Takano Dec. 1983 647 p 3 Vol.
(NASA-TM-86064-Vol-3; NAS 1.15:86064-Vol-3) Avail: NTIS HC A99/MF A01 CSCL 04B

Volume 3 of a 3-volume technical memoranda which contains documentation of the GLAS fourth order genera circulation model is presented. The volume contains the CYBER 205 scalar and vector codes of the model, list of variables, and cross references. A dictionary of FORTRAN variables used in the Scalar Version, and listings of the FORTRAN Code compiled with the C-option, are included. Cross reference maps of local variables are included for each subroutine. E.A.K.

N84-24051# Calspan Advanced Technology Center, Buffalo, N.Y.
THE ROLE OF VEGETATION IN THE LOW-LEVEL WATER BUDGET IN FOG Final Report, 2 Oct. 1982 - 2 Oct. 1983
B. J. Wattle, E. J. Mack, R. J. Pilie, and J. T. Hanley Jan. 1984 40 p
(Contract DAAG29-82-C-0022)
(AD-A139099; CALSPAN-7096-M-1; ARO-19985.1-GS) Avail: NTIS HC A03/MF A01 CSCL 04/2

Calspan conducted a limited investigation of the influence of vegetation on the low-level water budget in fog at Albany, NY, as part of the SUNY Fog Project. The objective of this field study was to explore the role of vegetation as a sink for liquid water in fog thorugh deposition, precipitation and impaction processes, and as a possible source of water which (through re-evaporation) could be instrumental in prolonging a fog. This effort was a follow-up to and expansion of past Calspan study of dew deposition and fog water impaction on vegetation. Measurements to date indicate that the presence of the grass has little or no effect on the rate of dew deposition; average measured dew deposition rates at Albany were 18 g/sq. m/hr. The data further show that fog water is deposited at rates which are two to five times those of pre-fog dew deposition rates. The data suggest that approximately one-half of the water deposition over the general meadow surface during deep, dense fog occurs primarily through precipitation. Fog water collection by impaction on vegetation which extends into the free air above the general meadow height accounts for the other 50% of deposited fog water. GRA

N84-24052# Technische Univ., Hanover (West Germany). Inst. fuer Meteorologie und Klimatologie.
METEOROLOGICAL AND CLIMATOLOGICAL CONDITIONS AFFECTING THE VERTICAL STRUCTURE OF VISIBILITY IN NORTHERN GERMANY Interim Technical Report, Oct. 1982 - Jan. 1984
R. Roth 24 Jan. 1984 79 p
(Contract DAJA37-82-C-0189; DA Proj. 1T1-61102-BH-57)
(AD-A139126; ITR-2) Avail: NTIS HC A05/MF A01 CSCL 04/2

This report described the current status of instrumentation and data acquisition being conducted at Sprakensehl, West Germany. Instruments include visibility meters, thermometers, dewpoint sensors, a cloud ceilometer, and tethersonde packages. Discussions include a description of the measurement system, data processing, and data organization. Summaries of acquired data are given. GRA

N84-24053# Air Force Global Weather Central, Offutt AFB, Nebraska.
AIR WEATHER SERVICE MODEL OUTPUT STATISTICS SYSTEMS
D. L. Best and S. P. Pryor Oct. 1983 90 p
(AD-A139129; AD-E850549; AFGWC/PR-83/001) Avail: NTIS HC A05/MF A01 CSCL 04/2

The development and operation of the Air Weather Service Model Output Statistics (MOS) System is described. A short history of the migration of MOS technology and software from the National Weather Service Technique Development Laboratory (TDL) to the Air Force Global Weather Central is provided. Emphasis is placed on the AWS MOS system's integration into the AFGWC production scheme, its capabilities, limitations, and the options available. GRA

N84-24054# Air Weather Service, Thule (Greenland).
INDEX OF AIR WEATHER SERVICE TECHNICAL PUBLICATIONS Final Report
1 Jul. 1983 46 p Supersedes AWS/TI-82/001, AD-A123 03
(AD-A139133; AD-E850597; AWS/TI-83/001; AWS/TI-82/001) Avail: NTIS HC A03/MF A01 CSCL 04/2

This index lists technical publications of the US Air Force Air Weather Service including its subordinate units. These units include the Air Force Global Weather Central, US Air Force Environmental

Technical Applications Center, 1st Weather Wing, 2nd Weather Wing, 3rd Weather Wing, 5th Weather Wing, and 7th Weather Wing. GRA

N84-24055# National Oceanic and Atmospheric Administration, Boulder, Colo. Air Resources Lab.
A PRELIMINARY STUDY OF THE FEASIBILITY OF DETECTING LONG-TERM TRENDS IN ATMOSPHERIC HUMIDITY
J. K. Angell, W. P. Elliott, and M. E. Smith Sep. 1983 41 p
(Contract DE-AI01-82ER-60059)
(DE84-006417; DOE/ER-60059/T2) Avail: NTIS HC A03/MF A01

Humidity data at the surface and at 850, 700 and 500 mb pressure surfaces at Brownsville, Texas, and Great Falls, Montana, were examined for the interval 1958 to 1980. It was found that the relative humidity at these two stations decreased between 1958 and about 1970 and has increased since, similar to the variation in Northern Hemisphere surface temperature. Mixing ratio and precipitable water varied in an analogous fashion. At these two stations mixed signals were obtained with regard to the relation between long term variations in temperature, relative humidity, and mixing ratio, but on the seasonal and yearly time scale, the relative humidity tended to be out of phase with temperature, and the mixing ratio in phase with temperature. The correlation between Northern Hemisphere precipitable water and surface 500 mb precipitable water at Brownsville and Great Falls was 0.87 and 0.66, respectively, with a correlation of about 0.50 between these precipitable water estimates and Northern Hemisphere surface temperature. DOE

N84-24056# Pacific Northwest Lab., Richland, Wash.
SIMULATION OF WINDS AS SEEN BY A ROTATING VERTICAL AXIS WIND TURBINE BLADE
R. L. George Feb. 1984 52 p refs
(Contract DE-AC06-75RL-01830)
(DE84-009033; PNL-4914) Avail: NTIS HC A04/MF A01

Turbulent wind analyses relevant to the design and testing of Vertical Axis Wind Turbines (VAWT) is reported. A technique was developed for utilizing high speed turbulence wind data from a line of seven anemometers at a single level to simulate the wind seen by a rotating VAWT blade. Twelve data cases, representing a range of wind speeds and stability classes, were selected. Simulations were run of the rotationally sampled wind speed relative to the Earth, and the tangential and radial wind speeds, which are relative to the rotating wind turbine blade. Spectral analysis is used to compare and assess wind simulations from the different wind regimes, as well as from alternate wind measurement techniques. The variance in the wind speed at frequencies at or above the blade rotation rate is computed for all cases, and is used to quantitatively compare the VAWT simulations with horizontal axis wind turbine (HAWT) simulations. Qualitative comparisons are also made with direct wind measurements from a VAWT blade. DOE

N84-24057# Royal Netherlands Meteorological Inst., De Bilt. Instrumentele Afdeling.
THE EVALUATION OF RAIN GAGES, ILLUSTRATED BY THE THIES RAIN GAGE AND THE ELECTRICAL RAIN GAGE OF THE ROYAL NETHERLANDS METEOROLOGICAL INSTITUTE (KNMI) [HET BEOORDELEN VAN REGENMETERS, MET ALS VOORBEELDEN DE THIES-REGENMETER EN DE ELETRISCHE KNMI-REGENMETER]
Sara H. Muller and Andre vanLonden 1983 52 p refs In DUTCH; ENGLISH summary
(KNMI-WR-83-16) Avail: NTIS HC A04/MF A01

The Thies rain gage, the electrical Royal Netherlands Meteorological Institute (KNMI) rain gage, and the standard KNMI rain gage were compared with each other and with World Meteorological Organization (WMO) requirements. The Thies drop counting system does not meet WMO requirements and is worse than the KNMI rain gages for the measurement of amounts. The Thies tipping bucket system results are so strongly dependent on the bucket cleanliness that errors of 5% are common. The use of such a system is not recommended. The electrical KNMI rain gage with float does not meet WMO requirements. The KNMI standard is simple, but an extra calibration is required if this gage is used for comparative measurements. Author (ESA)

N84-24058# Bureau of Reclamation, Denver, Colo.
PROJECT SKYWATER DATA INVENTORY, 1982-1983 SCPP (SIERRA COOPERATIVE PILOT PROJECT) DATA INVENTORY
Aug. 1983 223 p
(PB84-151489) Avail: NTIS HC A10/MF A01 CSCL 04B

This report contains an inventory of all data collected from October 15, 1982, through April 1983 in association with the SCPP (Sierra Cooperative Pilot Project), a weather modification research project in winter orographic cloud seeding. GRA

N84-24059# National Weather Service, Anchorage, Alaska.
CLIMATOLOGICAL FREQUENCY DISTRIBUTIONS FOR JUNEAU, ALASKA
Robert Jacobson, Jr., Carl Dierking, Russell Page, and Paul Shannon Nov. 1983 33 p
(PB84-154814; NOAA-84013001; TIP-3) Avail: NTIS HC A03/MF A01 CSCL 04B

Observed daily frequencies for various threshold values of temperature, precipitation, and snowfall have been derived from data collected at the Juneau International Airport between July 1943 and August 1983. GRA

N84-24060# National Weather Service, Silver Spring, Md.
GENERALIZED EXPONENTIAL MARKOV (GEM) UPDATING PROCEDURE FOR AFOS (AUTOMATION OF FIELD OPERATIONS AND SERVICES) Techniques Development Lab.
William C. Herrmann Dec. 1983 20 p refs
(PB84-154822; NOAA-NWS-TDL-CP-83-5; NOAA-84020201) Avail: NTIS HC A02/MF A01 CSCL 04B

An AFOS applications program which supplies short range guidance to the field forecaster is described. The guidance is in the form of categorical forecasts for all elements of a weather observation projected 1, 2, 4, and 6 hours into the future. The GEM program can be initiated in response to an alert generated by the monitoring program (Vercelli, 1983) or it can run as a stand-alone program for selected stations. This statistical procedure consists of a matrix of regression equations with the same weather elements as both predictors and predictands. GRA

N84-24061# National Oceanic and Atmospheric Administration, Rockville, Md. Federal Coordinator for Meteorological Services and Supporting Research.
NATIONAL SEVERE LOCAL STORMS OPERATIONS PLAN
Jan. 1984 60 p
(PB84-155241; FCM-P11-1984; NOAA-84013101) Avail: NTIS HC A04/MF A01 CSCL 04B

This is the seventeenth of an annual series of National Severe Local Storms Operations Plans. This plan is one of several operations plans produced under the auspices of the Federal Coordinator. The responsibilities of the various United States agencies which provide meteorological services in observing and forecasting severe local storms are outlined. NOAA Weather Radio is playing an increasing role in disseminating weather warnings among Federal agencies and during emergencies. Therefore, a revised chart of the transmitter locations and revised list of stations together with their frequencies are included. GRA

N84-24062# National Weather Service, Silver Spring, Md. Techniques Development Lab.
EXPERIMENTAL WIND FORECASTS FROM THE LOCAL AFOSMOS (AUTOMATION OF FIELD OPERATIONS AND SERVICES MODEL OUTPUT STATISTICS) PROGRAM
Harry R. Glahn Jan. 1984 66 p refs
(PB84-155514; NOAA/TM-NWS-TDL-72; NOAA-84013104) Avail: NTIS HC A04/MF A01 CSCL 04B

An experimental surface wind forecast system for WSFO Washington is described that could provide guidance for projections of 1 to 20 hours from the start times of 0800 and 1300 GMT.

Regression equations were developed for each of 32 stations and for each hour out to 20 hours. Predictors were the U- and V-wind components and speed from: (1) the station observation; (2) centralized MOS wind guidance; (3) geostrophic winds computed from a simple sea level pressure prediction model; and (4) objective analyses of wind observations. GRA

N84-24063# National Severe Storms Lab., Norman, Okla.
SINGLE DOPPLER VELOCITY SIGNATURES: AN ATLAS OF PATTERNS IN CLEAN AIR/WIDESPREAD PRECIPITATION AND CONVECTIVE STORMS
Vincent T. Wood and Rodger A. Brown Nov. 1983 81 p refs (Contract NA82SA-C-00761)
(PB84-155779; NOAA-TM-ERL-NSSL-95; NOAA-84020702) Avail: NTIS HC A05/MF A01 CSCL 04B

A variety of single Doppler velocity patterns that simulate those observed in the atmosphere are presented. Measurements in optically clear air/wide-spread precipitation are simulated using horizontally uniform wind fields that change with height. Measurements of horizontal flow fiels within thunderstorms are simulated using a combination of simple rotation, divergence/convergence and uniform flow models. Simulation are compared with actual Doppler velocity measurements to test the veracity of the simulations. GRA

N84-24064# Massachusetts Inst. of Tech., Cambridge.
EXPERIMENTAL STUDY OF THE FLUXES OF REDUCED SULFUR GASSES FROM A SALT WATER MARSH Ph.D. Thesis
Mary Anne Carroll 1983 205 p refs Prepared in cooperation with National Center for Atmospheric Research, Boulder, Colo. (Grant NSF C-760)
(PB84-159318; NCAR/CT-73) Avail: NTIS HC A10/MF A01 CSCL 04A

The primary goals were to determine the role of a salt water marsh in the global carbonyl sulfide (OCS) cycle, and to establish the diurnal and seasonal behavior of OCS from such a source. Secondary goals included the quantification of as many gases as could be reserved given the analytical instrumentation (optimized for OCS) and the constraints of sample storage and analysis requirements. Thus, the diurnal flux behavior of both OCS and hydrogen sulfide (H2S) were determined along with normalize concentration information for carbon disulfide (CS2). The influence of light intensity, soil moisture, and soil temperature on the rates of emission of these three gases was also monitored.
Author (GRA)

N84-24065# Science Applications, Inc., San Diego, Calif. Electronic Vision Systems Div.
AVHRR AEROSOL GROUND TRUTH EXPERIMENT Final Report
M. Griggs 3 Jan. 1984 44 p refs
(Contract NA83SA-C-00106)
(PB84-157882; SAI-83/1321; NOAA-84021612) Avail: NTIS HC A03/MF A01 CSCL 04A

An experiment was conducted at ten sites around the globe in 1980, using NOAA-6. Advanced Very-High-Resolution Radiometer data and coincident ground truth measurements, to investigate the variability of the relationship that exists between upwelling visible radiance and the aerosol optical thickness in the troposphere over oceans. The esuls of the data for the remaining sites are given. The results are compared. Author (GRA)

N84-24066# National Oceanic and Atmospheric Administration, Miami, Fla. Hurricane Research Div.
FISCAL YEAR 1983 PROGRAMS, FISCAL YEAR 1984 PROJECTIONS
1984 57 p
(PB84-158146; NOAA-84021611) Avail: NTIS HC A04/MF A01 CSCL 04B

The Hurricane Research Division (HRD) of AOML is NOAA's primary focus for research on hurricanes and tropical meteorology. The HRD's research is observationally and theoretically focused: improve the description of the hurricane's structure, dynamics and energetics; increase understanding of its multiscale interactive processes (from microphysical through vortex and environmental synoptic-scales); and improve predictability. GRA

N84-24067# National Hurricane Center, Miami, Fla.
ANNUAL DATA AND VERIFICATION TABULATION ATLANTIC TROPICAL CYCLONES, 1983
Gilbert B. Clark Jan. 1984 98 p
(PB84-161330; NOAA/TM-NWS-NHC-21; NOAA-84022401) Avail: NTIS HC A05/MF A01 CSCL 04B

The National Hurricane Center (NHC) provides a source of summarized data on Atlantic tropical cyclones. The following tropical cyclone prediction models were used at the National Hurricane Center for forecasting motion on an operational basis. GRA

N84-24068# National Oceanic and Atmospheric Administration, Washington, D. C. National Environmental Satellite, Data and Information Service.
ENVIRONMENTAL SATELLITE IMAGERY, OCTOBER 1983
Oct. 1983 100 p
(PB84-160001; KMRD-5.4-8310; NOAA-84021606) Avail: NTIS HC A05/MF A01 CSCL 04B

The Key to Meteorological Records Documentation No. 5.4 series is issued monthly. It describes current cloud data obtained by NOAA's operational environmental satellites. It contains daily global satellite imagery in condensed form as a guide to data stored in the NOAA archive, and is designed to help users select data for research and climatological use. GRA

N84-24069# Illinois State Water Survey, Champaign.
CLIMATE FLUCTUATIONS IN ILLINOIS: 1901-1980
Stanley A. Changnon, Jr. 1984 82 p refs
(PB84-159896; ISWS/BULL-68-84) Avail: NTIS HC A05/MF A01 CSCL 04B

Changes in climate which directly affect four areas of major activity and concern in Illinois: water, energy, agriculture, and transportation are outlined. Selected Illinois records for 1901-1980 on a variety of atmospheric conditions that allow assessment of climate fluctuations, climate trends, variability around the trends, and impacts of these changes on the four areas of concern are reported. Changes in statewide and regional precipitation and temperature, plus selected point (station) data are documented. Changes in other atmospheric conditions including relative humidity, sky cover and sunshine, visibility and related air quality, severe local storms, and wind speed and direction are presented. GRA

N84-24070# National Weather Service, Garden City, N.Y. Scientific Services Div.
MDR-PROCESSING MANUALLY DIGITIZED OBSERVATIONS
Matthew R. Peroutka Nov. 1983 50 p
(PB84-161462; NOAA-NWS-ERCP-15; NOAA-84022309) Avail: NTIS HC A03/MF A01 CSCL 04B

The MDR computer program reads 7 hours of radar observations from the local data base and produces three graphics. The graphics are one, three, and six hourly sums of MDR values or rainfall amounts. Convective and stratiform Z-R relations are provided along with the option for a user defined relation. GRA

N84-24071# National Weather Service, Garden City, N.Y. Scientific Services Division.
RANP: STABILITY ANALYSIS PLOT PROGRAM
Hugh M. Stone Feb. 1984 62 p
(PB84-161447; NOAA-NWS-ERCP-16; NOAA-84022310) Avail: NTIS HC A04/MF A01 CSCL 04B

New indicators of static stability, the energy indices EI1 and EI2, which may be computed with the AFOS application program RAN are discussed. These indices, formerly called B1 and B2, are based on the change of kinetic energy of a parcel as it moves upward through the atmosphere entraining environment air during its ascent. The energy indices utilize all the information in significant level sounding (UJ1) and should provide a more accurate measure of static stability. The RAN program computes the EI1 and EI2

indices, the equilibrium level, a variety of other traditional stability indices, and several other parameters, which can be derived from significant level raob data; the computation is done for a single raob station. GRA

N84-24072# Energy and Environmental Research Corp., Irvine, Calif.
EPA (ENVIRONMENTAL PROTECTION AGENCY) COMPLEX TERRAIN MODEL DEVELOPMENT DESCRIPTION OF A COMPUTER DATA BASE FROM SMALL HILL IMPACTION STUDY NO. 1, CINDER CONE BUTTE, IDAHO Final Report
Lawrence E. Truppi and George C. Holzworth Feb. 1984 117 p refs
(PB84-161439; EPA-600/3-84-038) Avail: NTIS HC A06/MF A01 CSCL 04B

A reliable model of atmospheric dispersion for pollutant emissions in irregular mountainous terrain, was presented. A comprehensive tracer field study, was carried out. Eighteen quantitative tracer experiments were conduced, each lasting 8 hr at night or early morning. Data consisted of direct and derived measures of temperature, wind, turbulence, solar and net radiation, and nephelometer coefficient of scattering. Tracer gas concentrations were detected by a network of approximately 100 samplers located on the slopes of the hill. The system used to collect the data, the operation procedures used to run the system, and its performance record are described. GRA

N84-24073# National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Sciences Group.
PROFS' DOPPLER RADAR DATA PROCESSING SYSTEM. PART 1: DESIGN AND IMPLEMENTATION WITH APPLICATION TO NEXRAD ALGORITHMS
Ron L. Alberty, F. James Holitza, Margot H. Ackley, John R. Smart, Robert C. Lipschutz, William F. Roberts, and Kenneth J. Leap Sep. 1983 157 p
(PB84-165224; NOAA/TM/ERL/ESG-3; NOAA-84030702) Avail: NTIS HC A08/MF A01 CSCL 04B

A processing and display system for Doppler radar data is described. This system processes a set of meteorological algorithms. The methodology used to develop this system is discussed, and details of the computer hardware and software are given. GRA

N84-24074# Texas Dept. of Water Resources, Austin.
CLIMATIC ATLAS OF TEXAS
Thomas J. Larkin and George W. Bomar Dec. 1983 160 p
(PB84-162908; TDWR/LP-192) Avail: NTIS HC A08/MF A01 CSCL 04B

Climate is defined by the long-term averages of atmospheric variables such as precipitation, temperature, evaporation and wind. This atlas identifies average conditions of these four major components of climate through a series of maps and wind roses. The maps depict the statewide distribution of monthly and annual values of average precipitation, average temperature, and average gross lake surface evaporation rates. Wind roses show the frequency of occurrence of average wind direction and speed in selected cities across the state of Texas. GRA

N84-24075# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
DETERMINATION OF CLOUD PARAMETERS FOR NEROS 2 FROM DIGITAL SATELLITE DATA Final Report, 30 Sep. 1981 - 30 Mar. 1983
Jan L. Behunek, Thomas H. VonderHaar, and Pat Laybe Mar. 1984 50 p refs
(Contract EPA-68-02-3731)
(PB84-162601; EPA-600/3-4-044) Avail: NTIS HC A03/MF A01 CSCL 04B

As part of the input for their regional-scale photochemical oxidant model of air pollution, known as the Regional Oxidant Model, requires statistical descriptions of total cloud amount, cumulus cloud amount, and cumulus cloud top height for certain regions and dates. These statistics are used to parameterize photochemical reactions, and to diagnose vertical transport of pollutants. The purpose of this work was to derive these statistics from digital satellite data. The first stage of the work was to apply a human-computer interactive technique to satellite data to distinguish cumulus clouds from clouds of other types, and to produce the cloud amount statistics for cells within specified grids. Next, the interactive technique was applied to the infrared data to calculate the mean cloud top temperature for each cell. GRA

N84-24076# Colorado Univ., Boulder. Cooperative Inst. for Research in Environmental Sciences.
CASE STUDY OF LAYER FINE STRUCTURE AND TURBULENCE WITHIN STABLE ELEVATED LAYERS
Earl Gossard, William Neff (NOAA), and Robert Zamora (NOAA) Sep. 1983 41 p refs Sponsored in part by Naval Ocean Systems Center
(PB84-158666; NOAA-TM-ERL-WPL-114; NOAA-84021609) Avail: NTIS HC A03/MF A01 CSCL 04B

Profiles of the wind and temperature structure within an elevated temperature inversion lying across the BAO 300 meter tower near Erie, Colorado reveal a fine structure reminiscent of the sheet and layer structure often seen in the ocean thermocline. Examination indicates that wind and temperature profiles sometimes 'saturate', adjusting themselves to a critical Richardson Number just small enough to maintain turbulence; the turbulence is created by shear instability of Kelvin-Helmholtz waves. The result offers hope of sensing temperature gradients aloft remotely from ground-based radar measurements of wind. One possible approach would be to reformulate meteorological problems in terms of temperature gradient, layer thickness and layer height. The gradient and height inform might also be integrated into radiometric profile retrieval processing to provide accurate integrated profiles. Author

N84-24077# National Weather Service, Silver Spring, Md. Weather Analysis and Prediction Div.
PUBLIC RESPONSE TO HURRICANE PROBABILITY FORECASTS
Jay Baker Jan. 1984 42 p refs
(PB84-158658; NOAA-TM-NWS-FCST-29) Avail: NTIS HC A03/MF A01 CSCL 04B

In the spring of 1983, an experiment was conducted to measure the effect which hurricane probability forecasts would have on public response. One group of respondents in Pinellas County, Florida was presented with 16 hypothetical hurricane threat situations described in terms of storm severity, storm location, National Hurricane Center 'alert' (watch, warning, neither), and local officials' statements regarding evacuation. Another group of residents was presented with exactly the same 16 threat situations, plus the probability that the storm would affect their area and the probabilities of its affecting other coastal locations. People in both groups were asked whether they would evacuate in each of the 16 situations. The 16 threats were constructed such that the variables involved were statistically independent of one another. Overall, probabilities were found to have little, if any, effect on public response one way or the other. Author (GRA)

N84-23941# Geological Survey, Washington, D. C.
WIND, WAVES AND SWELL IN THE ANTARCTIC MARGINAL ICE ZONE BY SEASAT RADAR ALTIMETER Abstract Only
William J. Campbell and Nelly M. Mognard (Centre National d'Etudes Spatiales, Toulouse) *In its* US Geological Survey Polar Res. Symp. 1983 p 6 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

N84-23953# Geological Survey, Washington, D. C.
CLIMATIC SIGNIFICANCE OF LACUSTRINE DEPOSITS AROUND LAKE VANDA AND DON JUAN POND, ANTARCTICA Abstract Only
George I. Smith and Irving Friedman *In its* US Geological Survey Polar Res. Symp. 1983 p 18 (For primary document see

N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N84-24078*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
NASA OCEANIC PROCESSES PROGRAM, FISCAL YEAR 1983 Annual Report
Robert M. Nelson, ed. and David C. Pieri, ed. May 1984 144 p refs
(NASA-TM-86248; NAS 1.15:86248; AR-4) Avail: NTIS HC A07/MF A01 CSCL 08C

Accomplishments, activities, and plans are highlighted for studies of ocean circulation, air sea interaction, ocean productivity, and sea ice. Flight projects discussed include TOPEX, the ocean color imager, the advanced RF tracking system, the NASA scatterometer, and the pilot ocean data system. Over 200 papers generated by the program are listed. A.R.H.

N84-24079# California Univ., San Diego. Inst. of Geophysics and Planetary Physics.
SEA LEVEL VARIATIONS AND OCEAN DYNAMICS IN THE ALEUTIAN ISLANDS Final Report, 1 Aug. 1981 - 30 Apr. 1983
D. C. Agnew 1 Mar. 1984 21 p
(Contract N00014-81-K-0684)
(AD-A139421) Avail: NTIS HC A02/MF A01 CSCL 08/3

The overall purpose of this project was to study ocean dynamics along the Aleutian Island chain, which is the boundary between the North Pacific Ocean and the Bering Sea. These two bodies of water communicate through a number of straits (usually called passes) which are shallowest at the eastern end (a list is given in Favorite, 1967). The specific goal of this project was to use pre-existing data sets, particularly long time series of sea level and meteorology, to understand something of the physical oceanography of the area. Particular questions of interest included: Tidal dynamics: how do the tides propagate along the chain and through the passes? Why is there an anomalously small S2 tide in the Bering Sea? What is the flux of tidal energy into the Bering Sea, and how is it distributed along the chain? Other sea level variations: how does atmospheric forcing affect low-frequency sea level changes? Are other low-frequency signals present that could be correlated with shelf waves or with changes in currents such as the Alaskan Stream (Favorite et al., 1976) near the island chain? Is there any nonlinear interaction between tides and sea level? Can any pattern of meteorology be associated with the harbor seiches observed in some of the tide records? This report presents what results were obtained: in all cases they are preliminary rather than final. GRA

N84-24080# Office of Naval Research, London (England).
BIBLIOGRAPHY OF THE RESEARCH STAFF OF THE UK INSTITUTE OF OCEANOGRAPHIC SCIENCES, BIDSTON OBSERVATORY (1979-83)
R. Dolan 19 Jan. 1984 21 p
(AD-A138597; ONRL-R-1-84) Avail: NTIS HC A02/MF A01 CSCL 08/3

This report provides an up-to-date listing of IOS Bidston's publications, many of which are in journals and report series that are not routinely available to oceanographers in North America. GRA

N84-24081# Woods Hole Oceanographic Institution, Mass.
FINDIF: A SOFTWARE PACKAGE TO CREATE SYNTHETIC SEISMOGRAMS BY FINITE DIFFERENCES
M. M. Hunt, L. Gove, and R. A. Stephen Nov. 1983 51 p
(Contract N00014-79-C-0071)
(AD-A138904; WHOI-83-42) Avail: NTIS HC A04/MF A01 CSCL 08/11

In order to study seismic wave propagation through laterally varying sea floor structures, a software package has been created to generate synthetic seismograms by finite differences. The elastic wave equation can be solved in two dimensions either for point sources in cylindrical coordinates or for line sources in rectangular coordinates. Vertical and radial variations of the elastic parameters are allowed. The package includes four programs. Input to the system consists of a short file containing parameter values to describe the model. The first program is used to initialize the system for the particular model being used. The source arrays and velocity matrices are each computed by a separate program. The final program, which actually carries out the finite difference calculations, includes six subroutines to implement different options based on alternative finite difference formulations. Two different kinds of output files are created by this program: one or more snap-shot files, and one time series file, which will usually include more than one series. Author (GRA)

N84-24082# Science Applications, Inc., McLean, Va.
UPPER OCEAN SHEAR DURING JASIN: A DETERMINISTIC AND STATISTICAL ANALYSIS Final Report
D. M. Rubenstein Feb. 1984 87 p
(Contract N00014-83-C-0057)
(AD-A139077; SAI-84-1027) Avail: NTIS HC A05/MF A01 CSCL 08/3

The shear field measured by the W1 mooring during JASIN 1978 was analyzed, using deterministic and statistical approaches. A significant fraction of the shear variance was at the semidiurnal tidal frequency. In order to determine whether the shear was associated with internal wave trains propagating from single or multiple sources, the eccentricity of the shear ellipse was analyzed. During seven periods of intense shear, the minor-to-major axis ratio was consistent with the theoretically predicted ratio of 0.89 for coherent internal waves. From the orientation of the shear ellipse, the probable source of the internal tides during three intense periods was found to be the Rockall Bank. A statistical model of shear was applied two periods of the JASIN experiment. Internal wave-induced shear during Period 2 was comparable in level to that measured during MILE, but levels recorded during period 1 were 40% higher. This variability is attributed to changes in the propagation of the internal tide, associated with the evolving field of mesoscale eddies. GRA

N84-24083# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
PRELIMINARY REPORT OF HF (HIGH-FREQUENCY) RADAR MEASUREMENTS OF SURFACE CURRENTS EAST OF THE STRAIT OF GILBRALTAR NEAR MARBELLA, SPAIN: OCTOBER 7-22, 1982, PART 1
S. White and J. Forberg Oct. 1983 559 p
(PB84-154244; NOAA-DR-ErL-WPL-3; NOAA-84012507) Avail: NTIS HC A24/MF A01 CSCL 08C

During October 1982 the surface currents in the Alboran Sea were mapped with a high-frequency radar system. The currents were measured synoptically over several thousand square kilometers for a period of 15 days. The report is a preliminary data report, in the form of surface current vector maps. The primary objective of the 1982 Donde Va field effort was to measure the velocity and structure of the inflowing Atlantic jet, while simultaneously measuring the structure of the western Alboran Gyre. Author (GRA)

N84-24084# National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
CURRENT VELOCITY PROFILES IN THE STRAITS OF FLORIDA FROM THE PEGAGUS CURRENT PROFLIER: SUBTROPICAL ATLANTIC CLIMATE STUDY 1982
Elizabeth J. Williams, Eric Marmolejo, Douglas Wilson, and Robert L. Molinari Dec. 1983 187 p ref
(PB84-154335; NOAA-TM-ERL-AOML-55; NOAA-84012506) Avail: NTIS HC A09/MF A01 CSCL 08C

The primary objective of the Sub-Tropical Climate Study (STACS) is to measure the variability of oceanic heat and mass

transport in Straits of Florida. STACS consists of several separate projects designed to complement and support each other in the collection of current velocity, transport and temperature data. The data is collected by different organizations using independent instruments and techniques. All data collection efforts have been concentrated in the region of 27 degrees N across the Straits of Florida. The approximate position(s) of the various observation strategies are presented. Pegasus data collected by AOML during four research cruises in April, June, September and November 1982 will be presented in this report. GRA

N84-23969*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A COMPARISON OF NUMERICAL RESULTS OF ARCTIC SEA ICE MODELING WITH SATELLITE IMAGES Abstract Only
Chi-Hai Ling (Geological Survey, Washington, D.C.) and Claire Parkinson *In* Geological Survey US Geological Survey Polar Res. Symp. 1983 p 40 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD CSCL 08L

N84-23970# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ARCTIC SEA ICE BY PASSIVE MICROWAVE OBSERVATIONS FROM THE NIMBUS-5 SATELLITE Abstract Only
William J. Campbell (Geological Survey, Washington, D.C.), Per Gloersen, and H. Jay Zwally (NASA. Goddard Space Flight Center, Tacoma, Wash.) *In* Geological Survey US Geological Survey Polar Res. Symp. 1983 p 40-41 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD CSCL 08L

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N84-24085# Mississippi State Univ., Mississippi State.
BIOCHEMICAL STUDIES ON THE INITIATION OF ODOR SENSING Final Report, 1 Dec. 1979 - 30 Apr. 1983
Robert B. Koch Jun. 1983 18 p refs
(Contract DAAG29-80-C-0033)
(AD-A129926; ARO-1687.5-LS) Avail: NTIS HC A02/MF A01 CSCL 06/3

The basic biochemical events which are responsible for the initiation of the process of odor sensing were investigated to understand human ability to sense and identify and infinite number of odorous compounds. It was observed that even newly synthesized organic compounds with sufficient volatility at room temperature can be detected by the sense of smell. It is suggested that specific receptors for odorous chemicals cannot be preexistent in the olfactory epithelial tissue, and that odor sensing and identification is due to pattern recognition of multiple perturbations of nerve action potentials. E.A.K.

N84-24086# Dayton Univ., Ohio.
USER'S GUIDE FOR COMBIMAN PROGRAMS (COMPUTERIZED BIOMECHANICAL MAN-MODEL), VERSION 6 Interim Report
P. Bapu, M. Korna, and J. McDaniel Dec. 1983 310 p
(Contract F33615-81-C-0505; AF Proj. 7184)
(AD-A139139; UDR-TR-83-51; AFAMRL-TR-83-097) Avail: NTIS HC A14/MF A01 CSCL 06/2

This User's Guide describes the procedures to operate the Air Force Aerospace Medical Research Laboratory's (AFAMRL) COMputerized Biomechanical MAN-model (COMBIMAN) programs. The Guide is based on programs as of 1 May 1981. The Guide includes an introduction to the man-model and the conventions used to develop and analyze crew station configurations. It also deals with the operations of the programs included in the COMBIMAN system. These programs include the interactive graphics program CBM06, and the three key data base creation/modification programs CBMAM, CBMCM, and CBMVM, which create and maintain the Data Bases of anthropometric surveys, crew station configurations, and visibility contour definitions respectively. The guide also contains a complete description of the use of CBMOFF, the off-line plot program. The guide to operate the four main programs includes descriptions of the processing capabilities for each program, definitions and examples of all input and output data formats, procedures to execute the programs, and explanations of all diagnostic messages generated by the programs. Author (GRA)

N84-24087# Washington Univ., Seattle. Bioelectromagnetics Research Lab.
EFFECTS OF LONG-TERM LOW-LEVEL RADIOFREQUENCY RADIATION EXPOSURE ON RATS. VOLUME 5: EVALUATION OF THE IMMUNE SYSTEM'S RESPONSE Final Report, Jun. 1980 - Feb. 1983
L. L. Kunz, K. E. Hellstrom, I. Hellstrom, H. J. Garriques, and R. B. Johnson Dec. 1983 44 p
(Contract F33615-80-C-0612; AF Proj. 7757)
(AD-A138535; USAFSAM-TR-83-50) Avail: NTIS HC A03/MF A01 CSCL 06/18

The immune system's response was evaluated in two groups of 10 rats each exposed to 2450-MHz 480-microWatts/sq cm RFR in circularly polarized waveguides for 21 h per day for 13 (Group 1) and 25 months (Group 2); two other groups of 10 rats each served as controls. Increases in the numbers of B- and T-cells and enhancement of the lymphocytic response to mitogen stimulation were seen in Group 1 but not in Group 2. The complement-receptor-positive cells and antibody formations were unaffected in both groups. GRA

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N84-24088*# National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 258)
May 1984 91 p
(NASA-SP-7011(258); NAS 1.21:7011(258)) Avail: NTIS HC $7.00 CSCL 06E

This bibliography lists 308 reports, articles and other documents introduced into the NASA scientific and technical information system in April 1984. E.A.K.

N84-24089# Arizona State Univ., Tempe. Human Performance Lab.
BIOCHEMICAL MEASUREMENTS OF THE HUMAN STRESS RESPONSE Final Report
G. S. Krahenbuhl and J. Harris Mar. 1984 63 p
(Contract F33615-80-K-0022; AF Proj. 2313)
(AD-A139381; AFHRL-TR-83-40) Avail: NTIS HC A04/MF A01 CSCL 06/19

The threefold purpose of the study was (a) to identify biochemical response patterns to specific modes of stress, (b) to continue the search for suitable methods of quantifying stress in operational settings, and (c) to compare biochemical and psychophysiological stress indices. Three experiments were conducted using Air Force pilots as subjects. One experiment focused on the biochemical responses of student and instructor pilots who were involved in flight precautionaries or emergencies. A second experiment explored the biochemical response patterns to different modes of stress. The third experiment assessed the relationship between biochemical and psychophysiological indices in pilots performing a task in a simulated hostile environment. When viewed in its entirety, data collected in the contract demonstrate a general response to a variety of stress modes, which is characterized by an increase in the excretion of epinephrine and norepinephrine, a

decrease in the ratio of dopamine to norepinephrine, and an increase in the ratio of norepinephrine to serotonin. When examined individually, the experiments revealed the following. Although there were some excretion patterns common to all stress conditions, specific response patterns were also noted for various modes of stress. A battery of indices was identified which reflected the stress response across many modes of stress in a variety of field settings, and biochemical and psychophysiological indices did not show good agreement. GRA

N84-24090# Wisconsin Univ., Madison.
HYPERPYREXIA AND HEAD TRAUMA Final Report, 1975 - 1983
T. A. Rudy 9 Mar. 1984 17 p
(Contract N00014-75-C-0939)
(AD-A139420) Avail: NTIS HC A02/MF A01 CSCL 06/15

Unilateral mechanical lesions of the anterior hypothalamic/preoptic (AH/PO) region of the rat were found to produce immediate pyrexia. The pyrexia was generated by the coordinated activation of heat gain and heat retention effectors. Its magnitude was not strongly affected by ambient temperature, and the plateau level of pyrexia was well defended in the face of forced perturbations of core temperature. Pyrexia could be prevented and reversed by the prostaglandin synthesis inhibitor, indomethacin. Intraventricular injection of fresh blood or serum derived at 37 deg C for from 2 hours to 21 days produced pyrexia in cats. Pretreatment of the cats with indomethacin prevented the pyrexia produced by the serums but including indomethacin in the incubating blood did not. These results indicate that prostaglandins are importantly involved in the production of pyrexia by AH/PO trauma and by intraventricular bleeding. Studies of the central nervous system site of action of prostaglandins in the production of pyrexia using a microinjection mapping method showed that the AH/PO region is the sole site of action in the upper portion of the rat brain. GRA

N84-24091# Navy Personnel Research and Development Center, San Diego, Calif.
EVALUATION OF EYE MOVEMENT TRAINING FOR NAVY PILOTS Final Report, Jul. 1982 - Sep. 1983
W. F. Thode, P. J. Tremont, and W. H. Smith Feb. 1984 24 p
(ZR0-0001)
(AD-A139489; NPRDC-TR-84-28) Avail: NTIS HC A02/MF A01 CSCL 05/9

A training program designed to enhance eye movement skills was examined to determine if Navy pilot's eye movements could be improved and if the improvement correlated with improvements in pilot performance. Results showed that eye movement skills were improved, but no relationship between the improved skills and available performance criteria could be identified.
Author (GRA)

N84-24092# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
THE EFFECTS OF Gx, Gy AND Gz FORCES ON CONE MESOPIC VISION Technical Report
D. A. Timpton Oct. 1983 58 p
(AF Proj. 7231)
(AD-A139498; AFAMRL-TR-83-047) Avail: NTIS HC A04/MF A01 CSCL 06/19

The effects of Gx, Gy, and Gz acceleration forces on cone-type mesopic vision threshold values are examined. An experimental has been conducted on the Dynamic Environment Simulator, a three-axis human centrifuge, to reproduce an acceleration environment in a simulated night flight combat situation. Acceleration environments studied were levels of +1Gz, +1Gy, +1Gy, +1.4Gz, +2.0Gz, +3.0Gz, +2.0Gy in combination with +1Gz. A visual task was performed which determined 20/50 visual acuity illumination threshold values. The +gz environment is known to cause profound visual symptoms at relatively high levels. Physiological parameters recorded were PaO2, by ear oximetry, heart rate, and visual acuity threshold values. Results were zero means obtained by self pairing with +1Gz controls. Analysis was done by two tailed t-test. Results showed no significant shift if luminance threshold values at +1Gy or +1.4Gz; significant increase in luminance threshold at the .05 level for +1Gx; and significant increase in luminance threshold at the .01 level for +2.0Gz, +3.0Gz, and +2.0Gy in combination with +1Gz. Results will be discussed with respect to individual variation, daily variation, wearing of glasses, cardiovascular effects, effects of head movement, and pulmonary effects. GRA

N84-24093# Michigan Univ., Ann Arbor. Perception Lab.
THE DETECTION OF NONPLANAR SURFACES IN VISUAL SPACE
W. R. Uttal, J. Brogan, K. McCreight, S. Robertson, and P. White 1 Mar. 1984 268 p
(Contract N00014-81-C-0266; RR0-4209)
(AD-A138761; Perlab-4) Avail: NTIS HC A12/MF A01 CSCL 06/16

This monograph presents the results of a series of 17 experiments designed to provide a partial answer to two questions concerning the detection of dotted forms in dotted visual masks: (1) What is the effect of the spatial geometry of three-dimensional, nonplanar forms on their detectability? (2) What is the effect on the signal-to-noise ratio on their detectability? The results of the study indicate that the spatial geometry exerts virtually no effect until a threshold level of geometrical complexity is exceeded by the stimulus forms. Beyond that threshold, the effects of form are significant but modest in absolute amplitude. The results further indicate that a putative large effect of form obtained with sinusoidal stimuli actually results form a violation of the Shannon-Weaver sampling theorem from information theory and is thus due to inadequate definition of the form rather than to the nature of the form. On the other hand, the signal-to-noise ratio strongly influences detectability, regardless of whether it is manipulated by varying the number of dots in the stimulus-form or by varying the number of masking dots. This study failed to extend a highly successful autocorrelation-type theory from two-dimensions to three-dimensions. The implications and background of this study are discussed in detail. GRA

N84-24094# Saint Louis Univ., Mo. Dept. of Physiology.
CARDIOVASCULAR AND RESPIRATORY RESPONSES TO MUSCULAR ACTIVITY DURING IMMERSION IN WATER AT DIFFERENT TEMPERATURES Final Report, 1977 - 1981
A. R. Lind, D. Phil, T. E. Dahms, C. A. Williams, and J. S. Petrofsky 5 Mar. 1984 18 p
(Contract N00014-77-C-0640)
(AD-A138894) Avail: NTIS HC A02/MF A01 CSCL 06/19

The thrust of this research program was to investigate muscular function during both sustained and intermittent isometric contractions as well as during rhythmic exercise carried out in air or during immersion of subjects to the neck in water at temperatures ranging from 15 C to 35 C. In one experiment the subjects were examined when they were completely under water. The limitations placed on muscular function in those varied circumstances may be related to the limits of flexibility of the cardiovascular and respiratory systems, to the temperature of the muscles and to the metabolic demands in aerobic, anaerobic and fatiguing exercise. Such events may place unexpected demands on both cardiovascular and respiratory function. Isometric exercise, either sustained or intermittent, was chosen to simulate carrying weights underwater, while bicycling, with the legs horizontal was chosen to approximate swimming. Studies were carried out to evaluate the changes that occur as a result of habituation to immersion in cold water. In addition, the mechanisms that compete for the local control of the circulation were examined during intermittent isometric contractions leading to muscular fatigue. GRA

N84-24095# Naval Aerospace Medical Research Lab., Pensacola, Fla.
AIRSICKNESS DURING NAVAL FLIGHT OFFICER TRAINING: FLEET READINESS SQUADRONS
W. C. Hixson, F.E.. Jr. Guedry, J. M. Lentz, and G. L. Holtzman 14 Dec. 1983 60 p
(DA Proj. F58-524)

(AD-A138973; NAMRL-1305) Avail: NTIS HC A04/MF A01 CSCL 06/5

This report documents the incidence and severity of airsickness experienced in 14 different fleet readiness squadrons (FRS) by 372 NFO students who flew a total of 8,325 hops during this phase of training. Treating this entire population as a single group, airsickness was reported to have occurred on 637 (7.65 percent) of the 8,325 hops, vomiting on 252 (3.03 percent) of the hops, and inflight performance degradation due to airsickness on 303 (3.64 percent) of the hops. Though these figures are lower than those reported previously for the primary and secondary phases of training, the FRS data showed significant variations according to the type-specific aircraft training pipeline followed by the students. Particularly noticeable were the high incidence rates occurring in the P-3 pipeline during FRS training. The report discusses probable causes for these pipeline variations based upon differences in the flight syllabi associated with each phase of training within a given pipeline. The report also relates student performance on the candidate motion reactivity tests to inflight airsickness performance during different phases of training. GRA

N84-24517# Joint Publications Research Service, Arlington, Va.
CONTRIBUTIONS OF SPACE MEDICINE TO MEDICAL RESEARCH Abstract Only
O. G. Gazenko, I. P. Neumyvakin, Ye. A. Kovalenko, R. M. Bayevskiy, and B. B. Yegorov *In its* USSR Rept.: Life Sci.: Biomed. and Behavioral Sci. (JPRS-UBB-84-007) 13 Apr. 1983 p 1-2 Transl. into ENGLISH from Zdorovye (USSR), no. 4, Apr. 1983 p 10-11 (For primary document see N84-24515 14-91)
Avail: NTIS HC A05/MF A01

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N84-24096# Washington Univ., Seattle. Dept. of Psychology.
PERFORMANCE IN DUAL TASKS Final Technical Report, 1 Apr. 1977 - 29 Feb. 1984
E. Hunt and M. Lansman 29 Feb. 1984 43 p Prepared in cooperation with North Carolina Univ. at Chapel Hill.
(Contract N00014-80-C-0631)
(AD-A138603; TR-84-2) Avail: NTIS HC A03/MF A01 CSCL 05/10

The goal of this project was to construct a single theoretical framework for the analysis of problem solving and real time 'attention and performance' behavior. Such a model has been developed. It has been realized as a computer program. The program is designed in a manner similar to that of various problem solving simulations that use the 'production system' approach. The program has been used to simulate results from choice reaction time, stimulus repetition, dual channel monitoring, and conflicting stimulus (Stroop) paradigms. In the development of the model several questions arose concerning human performance in situations requiring attention allocation. Experiments were conducted that showed that the mediation of attention allocation by stimulus frequency occurs through the automatic processing system, while attention allocation mediated by warning signals occurs through the controlled processing system. Further studies suggest that individual differences in the ability to control attention are specific to a stimulus modality, rather than due to a generalized ability to control attention. The theoretical framework developed here has been used as an integrative device to order the literature on individual differences in cognition, verbal comprehension, and techniques for assessing an individual's ability to memorize and recall information. Author (GRA)

N84-24097# Washington Univ., Seattle. Dept. of Psychology.
A UNIFIED MODEL OF ATTENTION AND PROBLEM SOLVING
E. Hunt and M. Lansman Feb. 1984 44 p Lecture held at New Haven, Conn., 1983
(Contract N00014-80-C-0631)
(AD-A138787; AD-F300387; TR-84-1) Avail: NTIS HC A03/MF A01 CSCL 05/10

The concept of production-executing machines has been used to construct a number of simulations of human problem solving. With a few exceptions the simulations have been of problem solving in situations in which there is no real-time pressure to respond. Such situations are typical of the paradigms used to study attention and performance. A model of production selection and execution has been developed that subsumes the previous problem solving models and that can be applied to real-time situations. The model has been used to simulate human performance in choice reaction time, stimulus repetition, dual task, and cue-conflict (Stroop) situations. This extends the use of production system models to encompass both problem solving and attention limited behavior. Author (GRA)

N84-24098# Washington Univ., Seattle. Dept. of Psychology.
SOCIAL SUPPORT AND PERFORMANCE IN COMPLEX ORGANIZATIONS Final Report, 1 Jun. 1980 - 31 Dec. 1983
I. G. Sarason 30 Jan. 1984 25 p
(Contract N00014-80-C-0522)
(AD-A138888; CO-ONR-010) Avail: NTIS HC A02/MF A01 CSCL 05/11

This is the Final Report of a research project carried out between June 1, 1980 and December 31, 1983. Nine technical reports and fourteen articles resulted from the project. The research dealt with social support, its assessment, relationship to performance, and stability over time. The findings showed that social support is related to performance, interpersonal skills and relationships in a complex organization. Social support provided in a performance situation was found to be especially helpful for individuals who perceived low levels of support in their personal lives. Author (GRA)

N84-24099# Pittsburgh Univ., Pa. Learning Research and Development Center.
PROBLEM SOLVING AND REASONING
J. G. Greeno and H. A. Simon Feb. 1984 152 p
(Contract N00014-79-C-0215; RR0-4206)
(AD-A138889; UPITT/LRDC/ONR/APS-14) Avail: NTIS HC A08/MF A01 CSCL 05/9

This long chapter reviews research on problem solving and reasoning; the intended use is as text material for advanced students and others needing a moderately detailed introduction to the topics. The orientation is primarily psychological, with significant attention given to results from artificial intelligence. Major theoretical concepts, such as problem representation, the problem space, strategic knowledge, and problem-solving search, are developed in detail; and major empirical methods such as thinking-aloud protocols, problem-behavior graphs, and use of error patterns and latencies, are described and illustrated. Sections of the chapter include: Problems with well specified goals and procedures, Problems of design and arrangement, Inductive problem solving, and Evaluation of deductive arguments. Author (GRA)

N84-24100# Naval Postgraduate School, Monterey, Calif.
DEVELOPMENT OF THE A-6E/A-6E TRAM/KA-6D NATOPS (NAVAL AIR TRAINING AND OPERATING PROCEDURES STANDARDIZATION) CALCULATOR AIDED PERFORMANCE PLANNING SYSTEM (NCAPPS) M.S. Thesis
D. F. Hargrave Dec. 1983 137 p
(AD-A138897) Avail: NTIS HC A07/MF A01 CSCL 01/3

The performance data contained in the Naval Air Training and Operating Procedures Standardization (NATOPS) manuals for Naval aircraft are presented primarily in graphical form. Interpretation of these graphical charts is time consuming and susceptable to error. By using multiple regression analysis and other curve fitting techniques the graphical charts can be modeled with closed-form analytical equations. These equations can then be used in computer programs which perform the same functions as the original charts but with greater accuracy, speed and simplicity.

This thesis conducts the above analysis on some of the more commonly used NATOPS performance data for the A-6 aircraft model. The result is the A-6E/A-6E TRAM/KA-6D NATOPS Calculator Aided Performance Planning System (NCAPPS) which is a library of A-6 performance software developed for the Hewlett-Packard HP-41CV hand-held programmable calculator. Procedures for developing the analytical models are described and a user's manual documenting the system is included.
Author (GRA)

N84-24101# Hershey (Milton S.) Medical Center, Hershey, Pa. Dept. of Behavioral Science.
EFFECTS OF STRESSORS ON TASK PERFORMANCE AND SATISFACTION Final Report
S. Streufert, S. C. Streufert, R. M. Pogash, and A. L. Denson Feb. 1984 13 p
(Contract N00014-80-C-0581)
(AD-A139039) Avail: NTIS HC A02/MF A01 CSCL 05/10

The present report presents a summary of efforts on a research project concerned with stressor effects on task performance (in simple and in complex tasks), on satisfaction and physiological responsivity. The orientation of the research project is discussed. Abstracts of all technical reports prepared during the contract period are presented. Finally, some of the major findings are listed. GRA

N84-24102# California Univ., Santa Barbara.
RESEARCH AGENDA IN NON-LINEAR DECISION SYSTEMS
Nov. 1983 81 p refs
(Grant NSF OIR-82-12817)
(PB84-161207; NSF/OIR-83006) Avail: NTIS HC A05/MF A01 CSCL 05J

Discussions presented at the workshop are summarized. Non-linear systems are identified as that class of open systems whose non-linear interactions permit evolution through bifurcation and self-structuring, and whose driving influences are the decisions of humans, both as individuals and interacting in groups. The concept of evolutionary systems is established as the overarching paradigm for non-linear decision systems, and these systems are explored within the context of the evolutionary paradigm. Representative research topics in non-linear decision systems are examined, including geographical evolution, urban and regional modeling, cognitive locus theory, cognitive process modelling of individual and aggregate decison making, periodic markets, evolutionary stages of national systems, and design of large infrastructure systems. Workshop participants are listed. GRA

N84-24155# Osaka Electro-Communication Univ. (Japan). Dept. of Management Engineering.
FUZZY REASONING UNDER NEW COMPOSITIONAL RULES OF INFERENCE
M. Nizumoto *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 273-278 refs (For primary document see N84-24115 14-59)
(AD-P002364) Avail: NTIS HC A19/MF A01 CSCL 05/10

N84-24156# Duke Univ., Durham, N. C. Dept. of Electrical Engineering.
A STUDY OF FUZZY RELATIONS AND THEIR INVERSE PROBLEM
Masaki Togai (Bell Telephone Labs., Inc., Holmdel, N.J.) and Paul P. Wang *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 279-285 refs (For primary document see N84-24115 14-59)
(AD-P002365) Avail: NTIS HC A19/MF A01 CSCL 05/10

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N84-24103# Joint Publications Research Service, Arlington, Va.
USSR REPORT: HUMAN RESOURCES
11 May 1984 76 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UHR-84-009) Avail: NTIS HC A05/MF A01

Methods for measuring the performance and productivity of agricultural and industrial workers are considered as well as the training of engineers. Increased productivity through the use of robots is examined. For individual titles, see N84-24104 through N84-24104.

N84-24104# Joint Publications Research Service, Arlington, Va.
ROBOTICS IMPACT ON LABOR PRODUCTIVITY EXAMINED
F. Mikhaylov *In its* USSR Rept.: Human Resources (JPRS-UHR-84-009) 11 May 1984 p 23-28 refs Transl. into ENGLISH from Sots. (Moscow), no. 1, Jan. 1984 p 52-54 (For primary document see N84-24103 14-54)
Avail: NTIS HC A05/MF A01

With the increased speed of automatic working, the frequency in fulfilling a complex of manual procedures in servicing semiautomatic machines also increases. The increase of labor productivity of semiautomatic machine operators is linked to a substantial rise of its intensiveness owing to the great volume of work, which is performed in a forced pose and under considerable monotony of labor. The problem of operator safety is discussed as well as the service life of industrial robots. A.R.H.

N84-24105# New Mexico State Univ., Las Cruces. Behavioral Engineering Lab.
HUMAN FACTORS AFFECTING PILOT PERFORMANCE IN VERTICAL AND TRANSLATIONAL INSTRUMENT FLIGHT Technical Report, 1 Jan. - 31 Dec. 1983
J. S. Tatro, L. Corl, and S. N. Roscoe Dec. 1983 92 p
(Contract N00014-81-K-0439)
(AD-A139141; BEL-83-1/ONR-83-1) Avail: NTIS HC A05/MF A01 CSCL 05/5

As part of an overall research program to develop both forward-looking and downward-looking tactical situation displays for all-weather instrument flight in VTOLs, an integrated horizontal situation display was developed for both vertical and translational flight. This report covers the development and initial experimentation of the downward-looking display and control system. The effects of eight factors on pilot performance as a function of those eight factors were derived for each of three dependent performance measures. Author (GRA)

N84-24106# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
PICKING PARTS OUT OF A BIN
B. K. P. Horn and K. Ikeuchi Oct. 1983 50 p
(Contracts N00014-77-C-0389; N00014-80-C-0505)
(AD-A139257; AI-M-746) Avail: NTIS HC A03/MF A01 CSCL 06/4

One of the remaining obstacles to the widespread application of industrial robots is their inability to deal with parts that are not precisely positioned. In the case of manual assembly, components are often presented in bins. Current automated systems, on the other hand, require separate feeders which present the parts with carefully controlled position and attitude. Here we show how results in machine vision provide techniques for automatically directing a mechanical manipulator to pick one object at a time out of a pile. The attitude of the object to be picked up is determined using a histogram of the orientations of visible surface patches. Surface orientation, in turn, is determined using photometric stereo applied to multiple images. These images are taken with the same camera but differing lighting. The resulting needle map, giving the orientations of surface patches, is used to create an orientation histogram which is a discrete approximation to the extended Gaussian image. This can be matched against a synthetic orientation histogram obtained from prototypical models of the objects to be manipulated. Such models may be obtained from computer aided design (CAD) databases. The method thus requires that the shape of the

objects be described, but it is not restricted to particular types of objects. Author (GRA)

N84-24107# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
AUTOMATIC SYNTHESIS OF FINE-MOTION STRATEGIES FOR ROBOTS
T. Lozano-Perez Dec. 1983 36 p
(Contracts N00014-81-K-0494; N00014-80-C-0505)
(AD-A139532; AI-M-759) Avail: NTIS HC A03/MF A01 CSCL 06/4

The use of active compliance enables robots to carry out tasks in the presence of significant sensing and control errors. Compliant motions are quite difficult for humans to specify, however. Furthermore, robot programs are quite sensitive to details of geometry and to error characteristics and must, therefore, be constructed anew for each task. These factors motivate the need for automatic synthesis tools for robot programming, especially for compliant motion. This paper describes formal approach to the synthesis of compliant motion strategies from geometric descriptions of assembly operations and explicit estimates of errors in sensing and control. A key aspect of the approach is that it provides correctness criteria for compliant motion strategies.
Author (GRA)

N84-24108# Joint Publications Research Service, Arlington, Va.
USSR REPORT: MACHINE TOOLS AND METALWORKING EQUIPMENT
8 May 1984 97 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UMM-84-009) Avail: NTIS HC A05

This serial report contains news items, abstracts, and articles of scientific reports on aspects of machine tools and metal working equipment including industry planning and economics; metal cutting and metal forming machine tools; metal working equipment; automated lines and aggregated machining systems; and robotics. For individual titles, see N84-24109 through N84-24113.

N84-24109# Joint Publications Research Service, Arlington, Va.
RESISTANCE TO ROBOTS IN SOVIET METALLURGICAL PLANTS NOTED
A. Valentinov *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-84-009) 8 May 1984 p 57-60 Transl. into ENGLISH from Sots. Industr. (USSR), 1 Feb. 1984 p 2 (For primary document see N84-24108 14-54)
Copyright. Avail: NTIS HC A05

Automation of the processes of ferrous metallurgy, including the aid of robots, demand fixed attention. The problems of implementing robotics in industries are discussed. B.G.

N84-24110# Joint Publications Research Service, Arlington, Va.
IMPACT OF LATVIAN ROBOTICS INSTITUTE ON INDUSTRY MODERNIZATION
E. Davydenko *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-84-009) 8 May 1984 p 61-64 Transl. into ENGLISH from Sov. Latv. (USSR), 6 Mar. 1984 p 2 (For primary document see N84-24108 14-54)
Copyright. Avail: NTIS HC A05

Social organizations of ministries, departments and enterprises must play a significant role in introducing robots. In fact, it is very important not only to accelerate the introduction of automation facilities, but also to explain its necessity, teach thrift and the economic operation of expensive robots. Author

N84-24111# Joint Publications Research Service, Arlington, Va.
BELORUSSIA'S INDUSTRY ROBOTIZATION PROGRAM DISCUSSED
A. T. Klimenkov *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-84-009) 8 May 1984 p 65-67 Transl. into ENGLISH from Sov. Belorussiya (USSR), 27 Jan. 1984 p 2 (For primary document see N84-24108 14-54)
Copyright. Avail: NTIS HC A05

The creative role of science and scientic-technical progress is impossible to overestimate. The efforts of academy, VUZ, branch and plant science was united in this 5 year period in the implementation of 43 programs on the most important scientific-technical problems and 7 target comprehensive programs: labor, quality, feed production powder metallurgy, and others. The fields of science yield an increasingly bountiful harvest to industry and agriculture. Author

N84-24112# Joint Publications Research Service, Arlington, Va.
LEVEL OF ROBOTIZATION OF KAZAKHSTAN INDUSTRY VIEWED
E. Ilgerbayev *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-84-009) 8 May 1984 p 68-74 Transl. into ENGLISH from Nar. Khoz. Kazakh. (USSR), no. 9, Sep. 83 p 39-43 (For primary document see N84-24108 14-54)
Copyright. Avail: NTIS HC A05

The acceleration of scientific and technological progress and transition of the economy to an intensive mode of development is a primary task set by the 26th CPSU congress for the 11th 5-Year Plan. One of the ways of achieving this is by raising labor productivity on the basis of the achievements of science and technology and the further mechanization and automation of production. The Basic Guidelines for the Economic and Social Development of the USSR for 1981 to 1985 and the period up to 1990 state the following on this score: To develop production and ensure extensive application of automatic manipulators (industrial robots) and built-in automatic control systems incorporating microprocessors and microcomputers, and to set up automated shops and plants. Author

N84-24113# Joint Publications Research Service, Arlington, Va.
CONTROL ALGORITHMS OF SOVIET HCS RUSALKA FOR ROBOTS ANALYZED
Andrey Aleksandrovich Petrov *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-84-009) 8 May 1984 p 75-93 refs Transl. into ENGLISH from Pocitace a Umela Inteligencia (USSR), v. 1, no. 1, Feb. 1982 p 83-96 (For primary document see N84-24108 14-54)
Copyright. Avail: NTIS HC A05

The analysis of control algorithms of robots, oriented toward the hybrid computer as the control system is examined. The Soviet hybrid computing system (PCS) Rusalka and the authropomorphous robot, developed in the MVTU [Higher Technical School imeni N. E. Bauman] with six degrees of freedom are used. The method of determining the allowed trajectory of the motion in case the trajectory is bypassed is presented. The presented algorithm of planning and organizing the robot's motion, realized on the hybrid computer, allows the efficient disparalleling of computing, which again allows a motion generation in a real or accelerated time scale. This property is used to identify the parameters of the real model and for the goals of adaptation. The advantages of the algorithms referred to are demonstrated with the specific examples. Author

N84-23914# Joint Publications Research Service, Arlington, Va.
INDUSTRY URGED TO INCREASE OUTPUT OF NC MACHINE TOOL, ROBOTICS
In its USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-84-008) 25 Apr. 1984 p 6-7 Transl. into ENGLISH from Pravda (Moscow), 2 Feb. 1984 p 1 (For primary document see N84-23913 14-37)
Avail: NTIS HC A04/MF A01

N84-23915# Joint Publications Research Service, Arlington, Va.
INDUSTRY OFFICIAL ON PROGRESS IN SOVIET ROBOTICS PROGRAM
M. Shkabardnya *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-84-008) 25 Apr. 1984 p 37-39 Transl. into ENGLISH from Pravda (Moscow), 7 Jan. 1984 p 2 (For primary document see N84-23913 14-37)
Avail: NTIS HC A04/MF A01

N84-23916# Joint Publications Research Service, Arlington, Va.
USE OF ROBOTS IN ESTONIAN AUTO, MACHINE TOOL INDUSTRIES VIEWED
Oleg Jurogin *In its* USSR Rept.: Machine Tools and Metalworking Equipment (JPRS-UMM-84-008) 25 Apr. 1984 p 40-42 Transl. into ENGLISH from Rahva Haal (Tallinn), 6 Mar. 1984 p 3 (For primary document see N84-23913 14-37)
Avail: NTIS HC A04/MF A01

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N84-24114*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
GEOMETRIC INTERPRETATIONS OF THE DISCRETE FOURIER TRANSFORM (DFT)
C. Warren Campbell May 1984 16 p refs
(NASA-TP-2332; NAS 1.60:2332) Avail: NTIS HC A02/MF A01 CSCL 12A

One, two, and three dimensional Discrete Fourier Transforms (DFT) and geometric interpretations of their periodicities are presented. These operators are examined for their relationship with the two sided, continuous Fourier transform. Discrete or continuous transforms of real functions have certain symmetry properties. The symmetries are examined for the one, two, and three dimensional cases. Extension to higher dimension is straight forward. E.A.K.

N84-24115# Northwestern Univ., Evanston, Ill.
THE THIRTEENTH INTERNATIONAL SYMPOSIUM ON MULTIPLE-VALUED LOGIC Final Report, May 1983
Silver Spring, Md. IEEE 1983 437 p refs Symp. held in Kyoto, 23-25 May 1983 Sponsored in cooperation with IEEE and ISMVL-Japan
(Grant AF-AFOSR-0018-83)
(AD-A136457; AFOSR-83-0836TR; ISSN-0195-623X; ISBN-0-8186-0016-0; LC-79-641110) Avail: NTIS HC A19/MF A01

The principles and philosophy of logic design are discussed as well as circuits and technology; threshold logic; algebra; charge coupled devices and their applications; switching theory; fuzzy logic; and detection and diagnosis. Implications for a VLSCI environment and for expert systems are also examined. For individual titles, see N84-24116 through N84-24172.

N84-24116# Montreal Univ. (Quebec). Centre de Recherches Mathematiques.
COMPLETENESS FOR UNIFORMLY DELAYED CIRCUITS c33
I. G. Rosenberg and T. Hikita (Tokyo Metropolitan Univ.) *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 2-10 refs (For primary document see N84-24115 14-59)
(AD-P002325) Avail: NTIS HC A19/MF A01 CSCL 12/1

The paper reports on the progress towards an effective completeness criterion for uniformly delayed multiple-valued combinatorial circuits. In view of previous work by Hikita & Nazaki and Hikita it suffices to study periodic closed spectra. GRA

N84-24117# Feng Chia Univ., Taichung (Taiwan). Dept. of Information and Computer Engineering.
A STUDY OF REDUCED DEPENDENCE IN MULTI-VALUED SEQUENTIAL MACHINES c64
T. C. Yang and A. S. Wojcik *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 12-20 refs Prepared in cooperation with Illinois Inst. of Tech., Chicago (For primary document see N84-24115 14-59)
(AD-P002326) Avail: NTIS HC A19/MF A01 CSCL 12/1

The problem of determining the existence of state assignments for multi-valued sequential machines with the property of reduced dependence is considered. The properties of and requirements for reduced dependence among state variables in the binary system are extended to that for multi-valued synchronous and asynchronous machines. A number of examples to illustrate these concepts is also presented. Author (GRA)

N84-24118# Kansai Univ., Osaka (Japan). Faculty of Engineering.
A PREPROCESSING PROCEDURE METHOD IN TERNARY CLAUSE SELECTION c64
Shigeru Imanishi and Noriaki Muranaka *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 21-26 refs (For primary document see N84-24115 14-59)
(AD-P002327) Avail: NTIS HC A19/MF A01 CSCL 12/1

We present an extension of the preprocessing procedure method used in the binary clause selection to the ternary clause selection. This extension is called a ternary preprocessing procedure method. We make use of the ternary preprocessing procedure in the ternary prime implicant generation. We discuss the experimental results comparing the ternary clause selection and the ternary clause selection using the ternary preprocessing procedure. Author (GRA)

N84-24119# Oklahoma Univ., Norman. School of Electrical Engineering and Computer Science.
A STRUCTURED DESIGN OF MULTIPLE-VALUED LSI/VLSI WITH BUILT-IN TESTING CAPABILITY c33
Samuel C. Lee and Krayim Santrakul *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 27-34 refs (For primary document see N84-24115 14-59)
(AD-P002328) Avail: NTIS HC A19/MF A01 CSCL 09/5

In this paper a structured design of subsystems of an MV LSI/VLSI chip with built-in testing capability is presented. This structured design which uses multiplexers and DFF's is obtained through the use of a tree-structured ASM chart. Since these circuits are highly structured and the procedure for obtaining the circuit values of the design from the ASM chart is rather straightforward and systematic, this design process may be adapted for automation. Author (GRA)

N84-24120# Kyoto Univ. (Japan). Dept. of Precision Mechanics.
AXIOMATIC CHARACTERIZATION AND COMPARATIVE ANALYSIS OF PREFERENCE ON DESIRABILITY AND POSSIBILITY c64
Osamu Katai and Sousuke Iwai *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 36-41 refs (For primary document see N84-24115 14-59)
(AD-P002329) Avail: NTIS HC A19/MF A01 CSCL 12/1

A complete axiomatic system which characterizes the preference relations (the relation of comparative desirability or comparative possibility in different cases) under Maximin (Minimax), Maximax), Bayesian, Probabilistic, Plausibilistic and Fuzzy theoretic evaluations is introduced. A set of these on preference relations is presented, and their validity is tested under the different systems. Based on these results, the commonalities and peculiarities of the preference relations are elucidated and a systematic way of identifying the underlying evaluation method of arbitrarily given preference data is constructed. Author (GRA)

N84-24121# Haifa Univ. (Israel). School of Education.
QUOTIENT ALGEBRAS FOR LOGICS OF IMPRECISION c64
Michael Katz *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 42-46 refs (For primary document

see N84-24115 14-59)
(AD-P002330) Avail: NTIS HC A19/MF A01 CSCL 12/1

The results obtained in this paper, while technically not very difficult to prove, are significant from a philosophical point of view. They help us understand the meaning of truth, falsity, negation and implication in our logic of approximation and draw comparisons with other logics. GRA

N84-24122# Naples Univ. (Italy). Ist. di Fisica Teorica.
IN THE LABYRINTH OF MANY VALUED LOGICS **c64**
Salvatore Guccione, Settimo Termini (CNR, Naples), and Roberto Tortora *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 47-53 refs (For primary document see N84-24115 14-59)
(AD-P002331) Avail: NTIS HC A19/MF A01 CSCL 12/1

The present paper reviews some aspects of recent developments of many-valued logics. It then does not aim at any completeness, rather the analysis presented here endeavors to provide only a possible Ariadne's thread to help the reader to find some paths that seemed to the authors worth following in the many-valued labyrinth of the various types of problems of the subject. GRA

N84-24123# Shanghai Inst. of Railway Technology (China). Dept. of Telecommunication.
THE NEW METHOD OF IMPLEMENTATION FOR TERNARY LOGIC SYSTEM **c33**
Li Meng and Gu Wei-Nan *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 56-60 refs (For primary document see N84-24115 14-59)
(AD-P002332) Avail: NTIS HC A19/MF A01 CSCL 09/5

In various ternary logic systems, a symmetric ternary logic system which satisfies lattice operation is most appropriate. A new method of implementation for ternary logic using COS/MOS circuits is put forward, only one circuit simple structure can construct a ternary logic complete system. The paper also discusses the possibility of applying this circuit for the implementation of J-OR and J-AND operation. Thus, the implementation for ternary logic system can be greatly simplified. Author (GRA)

N84-24124# Oita Univ. (Japan). Faculty of Engineering.
MICROPOWER CMOS IMPLEMENTATION OF THREE-VALUED LOGIC FUNCTIONS **c33**
Seiichi Muta *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 61-63 refs (For primary document see N84-24115 14-59)
(AD-P002333) Avail: NTIS HC A19/MF A01 CSCL 09/5

A method for implementing ternary logic functions with CMOS integrated circuits is proposed. This method has the significant advantage of very low static power consumption at any of three logic levels comparable to that of binary CMOS circuits, and also it needs no modification in the fabricating process of the present CMOS technology. Author (GRA)

N84-24125# Shanghai Inst. of Railway Technology (China).
LOW POWER 2-OF-3-VALUED CMOS SELF-CHECKING CIRCUITS **c33**
Hu Mou, K. C. Smith (Toronto Univ.), and H. T. Mouftah (Queen's Univ., Kingston, Ontario) *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 64-69 refs (For primary document see N84-24115 14-59)
(AD-P002334) Avail: NTIS HC A19/MF A01 CSCL 09/5

Two new schemes for the implementation of self-checking binary logic systems are proposed which utilizes low power 2-of-3-valued CMOS logic circuits. While 2-of-3-valued circuits are inherently ternary, only two of their three logic values are used in normal opration. The third (middle) logic value is used for self-checking and testing. To evaluate these circuits an open-short-conducting fault model for CMOS circuits is developed. All of the single faults in these circuits are studied and classified into four types, named mid-seeking, quasi-mid-seeking, mid-rejecting, and masked. The conclusions reached for 2-of-3-valued circuits in previous papers apply to these new circuits as well. Finally a comparison between implementation schemes is made on the basis of the size of the fault set each produces. Author (GRA)

N84-24126# Tokyo Univ., Kawagoe (Japan). Dept. of Electrical Engineering.
SYNTHESIS OF MULTIVALUED LOGIC CIRCUITS USING HYPERPLANES **c64**
Tatsuki Watanabe and Masayuki Matsumoto *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 72-77 refs (For primary document see N84-24115 14-59)
(AD-P002335) Avail: NTIS HC A19/MF A01 CSCL 12/1

This paper presents a method for synthesizing multivalued logic functions composed of hyperplanes which can be represented by multivalued multithreshold functions. In this method, multivalued logic functions can be synthesized using the operators algebraic + , - and . as well as logica max and min and no operators to yield binary values only is used. The theorem for such operations is presented. Simplified representations of functions can easily be obtained utilizing the expressions of hyperplanes. During the synthesizing process the various techniques of usual algebra and geometry are used when required. As for the circuit implementation, the one operation amplifier per one function method is presented. Author (GRA)

N84-24127# Nagoya Univ. (Japan). Education Center for Information Processing.
P-VALUED INPUT, Q-VALUED OUTPUT THRESHOLD LOGIC AND ITS APPLICATION TO THE SYNTHESIS OF P-VALUED LOGICAL NETWORKS **c64**
Takashiro Haga and Teruo Fukumura *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 78-83 refs (For primary document see N84-24115 14-59)
(AD-P002336) Avail: NTIS HC A19/MF A01 CSCL 12/1

In this paper, we describe an application of the p-valued input, q-valued output threshold elements (2 equal to or less than p, 3 equal to or less than p), namely (p,q)-logical elements, to the synthesis of the p-valued logical networks. The ideal of the (p,q)-logic stems from the considerations that on the threshold logic the extension of the input value to the many-valued one is quite easy, while a similar extension concerning outputs is very difficult. It is shown that under some restricted situation, the optimum value q^* of q can be determined to construct the minimum cost p-valued network using the (p,q)- threshold elements. Author (GRA)

N84-24128# Kyoto Univ. (Japan). Faculty of Engineering.
GENERATION OF TERNARY MAJORITY FUNCTIONS OF FOUR OR LESS VARIABLES **c64**
Hisashi Mine, Yoshinori Yamamoto (Higashiyamato High School, Tokyo), and Shiro Fujita (Okayama Univ. of Science, Japan) *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 84-91 refs (For primary document see N84-24115 14-59)
(AD-P002337) Avail: NTIS HC A19/MF A01 CSCL 12/1

This paper proposes a method of generating ternary majority functions which have been defined in the previous paper. The method is derived from the fact that the functional form of a ternary majority function is closely related to two binary threshold functions having common weights. All the representative ternary majority functions of four or less variables are tabulated. Finally, this paper shows that the total number of ternary majority functions of four variables is 40819. Author (GRA)

N84-24129# Northwestern Univ., Evanston, Ill. Dept. of Electrical Engineering and Computer Science.
ON THE NUMBER OF LOCATIONS REQUIRED IN THE CONTENT-ADDRESSABLE MEMORY IMPLEMENTATION OF MULTIPLE-VARIED FUNCTIONS **c33**
Jon T. Butler *In its* The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 94-102 refs (For primary document see N84-24115 14-59)
(AD-P002338) Avail: NTIS HC A19/MF A01 CSCL 09/5

A multiple-valued function can be realized by a binary content

addressable memory (CAM), a decoder which converts multiple-valued inputs to binary addresses, and a decoder which converts the binary CAM outputs to a multiple-valued output. Of particular interests is the number of CAM locations required in a specific implementation. In this paper, an upper bound on the storage requirements is derived for m-valued n-input functions. This is compared with the storage requirements for specific functions, such as the MIN and MAX functions. Also, the average number of locations is computed for m-valued n-input functions and is shown to be somewhat more than one-half of the upper bound.
Author (GRA)

N84-24130# IBM Watson Research Center, Yorktown Heights, N.Y. Mathematical Sciences Dept.
A FAST COMPLEMENTATION ALGORITHM FOR SUM-OF-PRODUCTS EXPERESSIONS OF MULTIPLE-VALUED INPUT BINARY FUNCTIONS **c64**
Tsutomu Sasao *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 103-110 refs Prepared in cooperation with Osaka Univ., Japan (For primary document see N84-24115 14-59)
(AD-P002339) Avail: NTIS HC A19/MF A01 CSCL 12/1
A recursive algorithm to obtain a complement of sum-of-products expression for a binary function of p-valued input variables is presented. GRA

N84-24131# Victoria Univ. (British Columbia).
THE SIMPLIFICATION OF MULTIPLE-VALUED SYMMETRIC FUNCTIONS **c64**
Jon C. Muzio, D. M. Miller (Manitoba Univ.), and G. Epstein (Indiana Univ., Bloomington) *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 111-119 refs (For primary document see N84-24115 14-59)
(AD-P002340) Avail: NTIS HC A19/MF A01 CSCL 12/1
A method is given for the synthesis of multiple valued symmetric function. In an earlier paper a canonical form was derived for the expression of each decisive multiple-valued fundamental symmetric function as a product of certain input terms based on the simple symmetric functions. An algorithm is given for the derivation of maximal product terms which may be used in a representation for a decisive symmetric function. The algorithm is extended to nondecisive symmetric functions and some samples given. In particular it is shown that the algorithm leads to an efficient realization for a ternary full adder. Author (GRA)

N84-24132# Hungarian Academy of Sciences, Budapest. Computer and Automation Inst.
SELFDUAL CLASSES AND AUTOMORPHISM GROUPS **c64**
J. Demetrovics, L. Hannak, and L. Ronyai *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 122-125 refs (For primary document see N84-24115 14-59)
(AD-P002341) Avail: NTIS HC A19/MF A01 CSCL 12/1
In this paper the authors investigate some problems connected with selfdual closed classes and permutation groups. A typical problem in this direction is the following. Let G be a permutation group. What is the cardinality of closed classes contained in the centralizer of G? We review some earlier results and discuss the case of small permutation groups. Some open problems are formulated, too. GRA

N84-24133# Hungarian Academy of Sciences, Budapest. Computer and Automation Inst.
ON FREE SPECTRA OF CLONES WITH SHARPLY TRANSITIVE AUTOMORPHISM GROUPS **c64**
J. Demetrovics and L. Ronyai *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 126-128 refs (For primary document see N84-24115 14-59)
(AD-P002342) Avail: NTIS HC A19/MF A01 CSCL 12/1
In this paper we determine the free spectra of clones selfdual to a sharply transitive permutation group. The result is a generalization of the authors' earlier results concerning regular groups, alternating and symmetric groups. The computation is based on extension properties of partial selfdual operations. GRA

N84-24134# Pontificia Univ. Catolica do Ecuador Quito (Brazil).
QUASITRANSITIVE ALGEBRAS **c64**
Lorenzo Pena *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 129-135 refs (For primary document see N84-24115 14-59)
(AD-P002343) Avail: NTIS HC A19/MF A01 CSCL 12/1
Quasitransitive algebras are (extensions of) both Kleene and Stone algebras supplied with: two additional, binary, operations: an equivalential operation, and the 'overmeet', (carrot) - which differs from ordinary meet in lacking idempotence, and in the joints not being distributive into it -; and with an additional unvary operation, n, which carries every entity into its lower threshold. The filter of dense elements is considered the truth filter, in virtue of the endorsement principle: what is, to some extent or other however small, true is true. The fuzzy sentential calculus Ap corresponding to those algebras is shown to be both sound and complete. GRA

N84-24135# International Business Machines Corp., Poughkeepsie, N.Y.
THE IMPLEMENTATION AND USE OF MULTIVALUED LOGIC IN A VLSI ENVIRONMENT **c33**
H. Fleischer *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 135-143 refs (For primary document see N84-24115 14-59)
(AD-P002344) Avail: NTIS HC A19/MF A01 CSCL 09/5
In this paper, multiple valued logic is discussed in terms of its implementation by PLAs. The history of the PLA is described and the relevance of multivalued logic to PLA development and logic minimization is discussed. An important aspect of VLSI implementation is used as a parameter to compare binary logic circuits with multiple valued logic circuits and certain conclusions are reached. The functional usefulness of n-valued Post logics is identified in terms of various applications. GRA

N84-24136# Hachinohe Inst. of Tech. (Japan). Dept. of Electrical Engineering.
PULSE-TRAIN RESIDUE ARITHMETIC CIRCUIT USING MULTIPLE-VALUED CHARGE-COUPLED DEVICES AND ITS APPLICATION TO DIGITAL FILTER **c33**
In Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 146-151 refs (For primary document see N84-24115 14-59)
(AD-P002345) Avail: NTIS HC A19/MF A01 CSCL 09/5
A new design method of compact residue arithmetic circuit using multiple-valued charge-coupled devices (CCD's) is proposed. The multiple-valued ring counter for the residue arithmetic is designed by using the CCD's. Because the structure of the counter is very simple, it is effectively used as the basic component to construct the residue arithmetic circuit. The modulo-m addition is performed by shifting the modulo-m multiple-valued ring counter, and the coefficient multiplication is done by converting the multiple-valued code between the counters. The most important advantages of the proposed adder and multiplier are the compact hardware and the uniform operating time, so that these arithmetic circuits can be effectively employed for the pipelining digital signal processing system. Finally, it is demonstrated that the hardware complexity of the digital filter constructed with the quaternary logic CCD's can be reduced to 70% compared with the corresponding binary implementation. GRA

N84-24137# Technische Hogeschool Twente, Enschede (Netherlands). Dept. of Electrical Engineering.
TOLERANCE ANALYSIS AND RELATED MEASUREMENTS ON MVL-CCD'S (MULTIPLE-VALUED-CHARGE-COUPLED DEVICES) Final Report **c33**
H. G. Kerhoff, J. deGroot, and A. C. Brombacher *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 152-161 refs (For primary document see N84-24115 14-59)
(AD-P002346) Avail: NTIS HC A19/MF A01 CSCL 09/5
Prior to designing an MVL system on a single silicon chip, it is necessary to perform a feasibility study on the marginal reliability aspects of the system to be implemented. In this paper,

the expected tolerances in basic CCD gate configurations are investigated by a statistical approach to the problem for which the Monte Carlo analysis method has been chosen. The expected tolerances were compared with actual data obtained from measurements. As any MVL function can be synthesized by means of these configurations, the tolerance behavior of a function can be investigated by a general applicable analysis method based on Monte Carlo tolerance analysis approach. The predecessor circuit was used to illustrate the procedure followed. GRA

N84-24138# Northwestern Univ., Evanston, Ill. Dept. of Electrical Engineering and Computer Science.
TABULAR METHODS FOR THE DESIGN OF CCD (CHARGE-COUPLED DEVICES) MULTIPLE-VALUED CIRCUITS c33
J. K. Lee and J. T. Butler *In its* The 13th Intern Symp. on Multiple-Valued Logic 1983 p 162-170 refs (For primary document see N84-24115 14-59)
(AD-P002347) Avail: NTIS HC A19/MF A01 CSCL 09/5

A tabular method for the design of multiple-valued CCD circuits is introduced which produces less expensive realizations with a significantly smaller table than a method proposed by Robroek and Kerkhoff and Robroek. In addition, a universal cost table method is shown which produces even less expensive realizations, but which has a considerably longer table. Further, a flexible CCD circuit is shown which produces any unary function by a simple adjustment of voltage levels. GRA

N84-24139# Himeji Inst. of Tech. (Japan). Dept. of Electronics.
SYNTHESIS METHOD FOR TERNARY LOGIC FUNCTION BASED ON NAND-TYPE POLYPHECK c60
M. Yanagita, N. Fukuda, Y. Miyoshi, K. Nakashima, and K. Yamoto *In* Northwestern Univ. The 13th Intern Symp. on Multiple-Valued Logic 1983 p 172-176 refs (For primary document see N84-24115 14-59)
(AD-P002348) Avail: NTIS HC A19/MF A01 CSCL 09/2

This paper studis the synthesis of ternary logic functions based on a NAND-type polypheck. The size of term is the arithmetic sum of its truth values over all assignments of variable values. It serves as a measure of complexity. GRA

N84-24140# Wanzhong Machinery Plant, Sichuan (China).
VECTOR EXPANSION TRANSFORMATION OF LOGIC ALGEBRA c33
L. Zhimo and Y. Yougnang (Wuhan Digital Engineering Inst., Hubel, China) *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 177-182 refs (For primary document see N84-24115 14-59)
(AD-P002349) Avail: NTIS HC A19/MF A01 CSCL 09/5

We analyse the mathematical structure of the vector expression of star algorithm here, where the concept of vector expansion transformation is presented. We also describe this transformation which can be generalized to the general Boolean algebra as well as other logic systems. Virtually we demonstrate that the operation problems of genral logic value can be transformed into those of binary Boolean expression and advance calculation formulas of transformation under various situations. It is proved that this method is of certain significance in switching theory and in practical applications. GRA

N84-24141# Quebec Univ., Trois-Riveres. Dept. of Mathematics.
ROOTS OF N-VALUED SWITCHING FUNCTIONS c33
Corina Reischler and Dan A. Simevici (Massachusetts Univ., Amherst) *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 183-188 refs Sponsored by Natural Sciences and Engineering Research Council of Canada (For primary document see N84-24115 14-59)
(AD-P002350) Avail: NTIS HC A19/MF A01 CSCL 09/5

A root of order u of a transformtion f of a finite set is a transformation of this set which iterated for u times gives f. The existence of such roots is discussed. The paper offers a new insight on the existence of square roots of Boolean functions as well as an algorithm for extracting the roots of g - ary,p- valued switching functions. GRA

N84-24142# California Univ., Davis. Integrated Circuits Lab.
A QUATERNARY LOGIC ENCODER-DECODER CIRCUIT DESIGN USING CMOS c33
D. A. Freitas and K. W. Current *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 190-195 refs Sponsored in part by Data General Corporation (For primary document see N84-24115 14-59)
(AD-P002351) Avail: NTIS HC A19/MF A01 CSCL 09/5

A binary-to-quaternary encoder and quaternary-to-binary decoder circuit pair is described as designed in a 5-volt CMOS technology. These circuits communicate with logical currents. Using model parameter values for a standard 5-micron polysilicon gate process technology and 10 microamp logical currents, we have simulated propagation delays of about 20 ns from binary encoder input to binary decoder output. with the encoder using scaled-up logical currents and driving a 100 pF load on the decoder input to simulate communication between chips, we observe simulated worst-case delays of about 35ns. GRA

N84-24143# Yatsushiro Technical Coll., Kumamoto (Japan). Dept. of Information and Electronic Engineering.
REALIZATION AND ANALYSIS OF A MASK-PROGRAMMABLE I2L MULTIVALUED LOGIC CIRCUIT c33
K. Taniguchi, T. Inoue, and F. Ueno *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 196-200 refs (For primary document see N84-24115 14-59)
(AD-P002352) Avail: NTIS HC A19/MF A01 CSCL 09/5

This paper presents a new mask-programmable I2L multivalued logic circuit. The proposed logic circuit is a variable operational circuit using the ROM structure. The sensitivity analysis is given for this logic circuit assuming equal current gain error for all multicollector transistors and equal current error for all threshold current sources. The limitations on the numbe of the truth values and on that of the input variables are discussed usng the results of the sensitivity analysis. The operation of the proposed circuit is confirmed by the breadboard testing. GRA

N84-24144# Nihon Univ., Funabashi (Japan). Dept. of Electronic Engineering.
LOGIC-TYPE SCHMITT CIRCUIT USING MULTI-VALUED GATES Final Report c33
M. Wakui and M. Tanaka *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 201-206 refs (For primary document see N84-24115 14-59)
(AD-P002353) Avail: NTIS HC A19/MF A01 CSCL 09/5

Logic-type Schmitt circuits (LTSCs) proposed in this paper by author's proposal are a new detector for a multi-valued multi-threshold logic circuit, and it realizes the high resolution with a little hysteresis or the high noise margin. The detector consists of the combinations of the multi-valued gates (MVGs) and a positive reaction device (PRD), and each circuit can be realized by the conventional elements. This paper shows their practical circuits, and describes the regions and the conditions for their operation. GRA

N84-24145# Nottingham Univ. (England). Dept. of Mathematics.
A GENERAL METHOD FOR THE EVALUATION OF DEGREE OF COMPLETENESS c64
A. Rose *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 208-213 refs (For primary document see N84-24115 14-59)
(AD-P002354) Avail: NTIS HC A19/MF A01 CSCL 12/1

Substitution rule type formalizations of propositional calculi without constants are derived from existing axiom scheme type formalizations. GRA

N84-24146# Hiroshima Univ. (Japan). Dept. of Applied Mathematics.
THREE-VALUED LOGIC AND ITS APPLICATION TO THE

QUERY LANGUAGE OF INCOMPLETE INFORMATION **c64**
A. Nakamura *In* Northwestern Univ. The 13th Intern. Symp. of Multiple-Valued Logic 1983 p 214-218 refs (For primary document see N84-24115 14-59)
(AD-P002355) Avail: NTIS HC A19/MF A01 CSCL 12/1

Lipski has considered a mathematical model of incomplete information and discussed some problems related to it. Also, we introduced a second-order predicate logic corresponding to the query language and solved some interesting problems about the decidability of this language. This paper proposes a 3-valued (left brace 1,1/2,0 right brace) logic based on this model instead of the above second-order predicate logic. By the aid of this 3-valued logic we give an axiomatic system of this query language.
Author (GRA)

N84-24147# Haifa Univ. (Israel). School of Education.
TOWARDS A FORMAL MULTI-VALUED UTILITY THEORY **c64**
M. Katz *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 219-221 refs Submitted for publication (For primary document see N84-24115 14-59)
(AD-P002356) Avail: NTIS HC A19/MF A01 CSCL 12/1

The paper provides an axiomatization in a multi-valued language of some basic predicates of utility theory. This axiomatization is based on deductions interpreted so that assertions which are theoretically error-free can be treated in an approximate way in actual structures for the language. Author (GRA)

N84-24148# Barcelona Univ. (Spain). Dept. de Matematiques i Estadistica.
AN APPROACH TO FUZZINESS IN THE SETTING OF LUKASIEWICZ LOGIC **c64**
E. Trillas *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 222-226 refs (For primary document see N84-24115 14-59)
(AD-P002357) Avail: NTIS HC A19/MF A01 CSCL 12/1

The paper seeks to understand the meaning of fuzziness. Its aim is to show how in some cases fuzziness comes from the indistinguishability between a fuzzy set and its falsum, in a sense close to Lukasiewicz ideas in Multiple-Value Logic. With such an aim the notion of indistinguishability relation is considered and some partial results are obtained. Author (GRA)

N84-24149# Meiji Univ., Kawasaki (Japan).
SYNTHESIS OF AXION SYSTEMS FOR THE THREE-VALUED PREDICATE LOGIC BY MEANS OF THE SPECIAL FOUR-VALUED LOGIC **c64**
M. Goto, S. Kao, and T. Ninomiya *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 228-234 refs (For primary document see N84-24115 14-59)
(AD-P002358) Avail: NTIS HC A19/MF A01 CSCL 12/1

In this paper, M. Wajsberg's axiom system is improved to the complete system by means of the spcial 4-valued logic. Similarly Kleene's 3-valued logic and Bochvar's one are also axiomatized to the complete systems. Finally those three systems are extended to the predicate logic systems. Such method is applicable to other multiple-valued logic systems. Author (GRA)

N84-24150# Tohoku Univ., Sendai (Japan). Dept. of Electronic Engineering.
IMAGE PROCESSING ALGORITHMS FOR A MULTIPLE-VALUED ARRAY PROCESSOR **c33**
M. Kameyama, K. Suzuki, and T. Higuchi *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 236-241 refs (For primary document see N84-24115 14-59)
(AD-P002359) Avail: NTIS HC A19/MF A01 CSCL 09/5

A new digital image processor calld multiple-valued array processor (MVAP) is effectively employed for systematic image processing without encoding and decoding because each pixel can be directly expressed by a single multiple-valued digit in the images with gray levels of several colors. In this paper, some properties of image processing in the MVAP are presented. Especially, the near-neighbor instructions can be attributed to template matching as the state transition function. In multiple-valued logic, there exist many templates because of its logical richness. The simplification of the state transition function is very useful for the effective execution of the image processing. The systematic design method of the image processing algorithm and its simplification using a minimization and its simplification using a minimization technique of multiple-valued logic functions are discussed. Author (GRA)

N84-24151# Toronto Univ. (Ontario). Dept. of Electrical Engineering.
TERNARY TRANSMISSION TO LOCAL AREA NETWORKS **c32**
S. G. Zaky and Z. G. Vranesic *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 242-248 refs (For primary document see N84-24115 14-59)
(AD-P002360) Avail: NTIS HC A19/MF A01 CSCL 17/2

This paper proposes a number of ternary codes for the transmission of binary data in local area networks. The proposed codes are suitable for asynchronous transmission. It is very easy for the receiver to recover the transmission clock, without the need for phase-locked loops and related hardware. Provision is also made for unique representations for message delimiters, or flags. The main advantage of the proposed approach is the simplification of the transmitter and the receiver hardware.
Author (GRA)

N84-24152# Maryland Univ., College Park. Dept. of Electrical Engineering.
SOME DEVICE COUNT COMPARISONS FOR REDUCED CONTROL STORES USING MOS (METAL-OXIDE SEMICONDUCTOR) CIRCUITS **c60**
C. B. Silio, Jr. and J. H. Pugsley *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 249-254 refs (For primary document see N84-24115 14-59)
(AD-P002361) Avail: NTIS HC A19/MF A01 CSCL 09/2

The design of decoders for multiple-valued MOS read-only memories (ROMs) used for reducing chip area in microprogrammed digital processors is considered. Using the threshold detection circuitry implemented by Intel Corporation, we present designs for one-out-of-four, one-out-of-sixteen, and one-out-of-thirty-two decoders for use with optimal radix four encodings of the microoperations in control stores, thus providing single layer decoding of the microoperations at the ROM outputs. We also include discussion of a design for a one-out-of-eight decoder for octal ROM cells. We use a newly obtained radix four optimal grouping of microoperations for the 256 word, 75 microoperation control store example derived from the control store of a Digital Equipment Corporation PDP-11/40 central processing unit to illustrate device counts obtainable, and we compare these counts to the two layer decoding scheme obtained by using a k-bits pr cell encoding with 2k-to-binary code translation. Author (GRA)

N84-24153# Northwestern Univ., Evanston, Ill.
A QUATERNARY CELLULAR ARRAY COMPLEX NUMBER MULTIPLIER **c64**
Tich T. Dau *In its* The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 255-262 refs (For primary document see N84-24115 14-59)
(AD-P002362) Avail: NTIS HC A19/MF A01 CSCL 12/1

Knuth has proposed an unconventional single component representation of complex numbers whereby the radix is chosen to be purely imaginary (2j) with the digit set comprised of the first four positive integers (0.1,2,3,). This is in contrast with the conventional two components representation with binary radix whether in Cartesian or polar coordinates. As shown in a previous paper this novel representation leads to simple and interesting arithmetic in the complex field. In this paper we shall examine the design of a complex-number multiplier, organized in a regular cellular array. Such a structure is highly desirable for VLSI implementation. Author (GRA)

N84-24154# Florida State Univ., Tallahassee. Dept. of Mathematics and Computer Science.

A COMPARISON OF FUZZY SWITCHING FUNCTIONS AND MULTIPLE-VALUED SWITCHING FUNCTIONS c64

David R. Luginbuhl and Abraham Kandel *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 264-272 refs (For primary document see N84-24115 14-59)

(AD-P002363) Avail: NTIS HC A19/MF A01 CSCL 12/1

The fact that a fuzzy switching function may take on infinitely many values is a good reason to examine the relationship between fuzzy switching functions and multi-valued (or multiple-valued or many-valued) switching functions. There are many aspects of the two types of functions that can be compared. After presenting a brief introduction to both multi-valued switching functions and fuzzy switching functions, we will compare some of the features of the two types of functions. We will then propose an algorithm which minimizes fuzzy functions, using techniques previously applied only to multi-valued switching functions. Author (GRA)

N84-24155# Osaka Electro-Communication Univ. (Japan). Dept. of Management Engineering.

FUZZY REASONING UNDER NEW COMPOSITIONAL RULES OF INFERENCE c53

M. Nizumoto *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 273-278 refs (For primary document see N84-24115 14-59)

(AD-P002364) Avail: NTIS HC A19/MF A01 CSCL 05/10

This paper indicates that most of fuzzy translating rules for a fuzzy conditional proposition If x is A then y is B with A and B being fuzzy concepts can infer very reasonable consequences which fit our intuition with respect to several criteria such as modus ponens and modus tollens, if new compositions and called max-O composition and max-A composition are used in the compositional rule of inference, though, as was pointed out previously, reasonable consequences can not always be obtained when using the max-min composition which is used usually in the compositional rule of inference. Author (GRA)

N84-24156# Duke Univ., Durham, N. C. Dept. of Electrical Engineering.

A STUDY OF FUZZY RELATIONS AND THEIR INVERSE PROBLEM c53

Masaki Togai (Bell Telephone Labs., Inc., Holmdel, N.J.) and Paul P. Wang *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 279-285 refs (For primary document see N84-24115 14-59)

(AD-P002365) Avail: NTIS HC A19/MF A01 CSCL 05/10

This paper consists of two main topics relating to the fuzzy logic and reasoning: fuzzy implication and its inverse problem. Firstly, the characteristic difference of various types of implication functions will be analyzed by introducing two new relations: namely the joint relation and the conditional one. Secondly, a novel method to find upper and lower bounds of the solution of fuzzy inverse problem is introduced. In addition to the conventional man-min operation, we propose a new operation, namely p,omega-composition, to solve the problem effectively. Theorems concerning the bounds and the composite mappings of fuzzy sets are also presented. Author (GRA)

N84-24157# Meiji Univ., Kawasaki (Japan). Faculty of Engineering.

REGULAR TERNARY LOGIC FUNCTIONS. TERNARY LOGIC FUNCTIONS SUITABLE FOR TREATING AMBIGUITY c64

Masao Mukaidono *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 286-291 refs (For primary document see N84-24115 14-59)

(AD-P002366) Avail: NTIS HC A19/MF A01 CSCL 12/1

A special group of ternary functions, called regular ternary logic functions, are defined. These functions are useful in switching theory, programming languages, algorithm theory and many other fields, if we are concerned with the indefinite state in such fields. This paper describes the fundamental properties and representations of the regular ternary logic functions. Author (GRA)

N84-24158# Tokushima Bunri Univ. (Japan).

CYCLIC ST-AN CODES AND MODULAR ST DISTANCE c38

Yoshiteru Ohkura, Ryosaku Shimada (Tokushima Univ., Japan), and Toshiharu Masegawa (Kyoto Univ., Japan) *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 294-299 refs (For primary document see N84-24115 14-59)

(AD-P002367) Avail: NTIS HC A19/MF A01 CSCL 09/4

Cyclic AN codes play important roles for detecting and correcting errors in digital systems consisting of arithmetic processors and data transmission channels. This paper describes a new class of ternary cyclic AN codes for the digital systems using the symmetric-ternary numbers. In this class, every code with code length n is an Ideal in the finite ring of the absolute-minimum residue class modulo 3 to the nth power-1. A new concept of modular distance is introduced for these codes. Many formulas to calculate the actual minimum distance are presented. A good number of multiple-error correcting codes are effectively constructed. Author (GRA)

N84-24159# Chiba Univ. (Japan). Dept. of Electronic Engineering.

A UNIFIED APPROACH TO COMPOSITE MVL WITH MONOTONIC SUBFUNCTION c33

Maturoh Nakamichi and Hideo Itoh *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 300-305 refs (For primary document see N84-24115 14-59)

(AD-P002368) Avail: NTIS HC A19/MF A01 CSCL 09/4

The concept of composite multiple-valued logic (CMVL) is introduced. The CMVL has subfunctions in the subsets of logical values. The subfunctions, especially monotonic ones play role to make the system testable; fault detectable and diagnosable. The CMVL contains C-type fail safe logic and A-type which have one monotonically increasing subfunction, and also contains some new logics, D-type with two monotonic ones, J-type with three monotonic ones etc. Classification and properties of these functions and systems are discussed using the concept of CMVL, and the properties give suggestions for design strategies of two valued or binary and multiple valued or higher radix testable logical systems. GRA

N84-24160# Poznan Technical Univ. (Poland). Regional Computer Center.

AN ALGEBRAIC METHOD FOR HAZARD ANALYSIS WITH THE MAXIMUM NUMBER OF SPIKES IN COMBINATIONAL AND SEQUENTIAL CIRCUITS c64

Janusz Rajski and Jerzy Tyszer *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 306-313 refs (For primary document see N84-24115 14-59)

(AD-P002369) Avail: NTIS HC A02/MF A01 CSCL 12/1

A method is described for hazard analysis with the maximum possible number of spikes in combinational and sequential circuits with NAND gates and flip-flops. This paper studies the conditions of creation and propagation of hazards. The influence of hazards of inputs on steady-state of the outputs of a flip-flop with synchronous and asynchronous triggering is considered. Partial results are given in A4 alphabet, where we assume all lines to be 0 or 1. Final, complete results are given in All alphabet, where some lines may be x, i.e., in unknown state. Author (GRA)

N84-24161# Chongquing Univ. (China).

FOUR-VALUED LOGIC STAR ALGORITHM AND THEIR APPLICATIONS c64

Ting-huai Chen, You-guang Yuan, Zhi-mo Liu, and Shi-min Chang *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 314-325 refs (For primary document see N84-24115 14-59)

(AD-P002370) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper is a survey of the works done in Chongqing University on Four Valued Logic which is useful for describing the dynamic behaviors of logical objects. The mathematical Basis of Four Valued Logic has been stated. The deduction method Star Algorithm has been introduced. Three kinds of applications based on different explanations of the component have been dealt with,

such as the fault detection of the combinational and the sequential circuits, the hazardous test generation as well as the transition logic. GRA

N84-24162# Department of Defense, Washington, D. C.
Mx, A MIX-VALUED ALGEBRA
Michael Sinutko, Jr. and James H. Pugsley (Maryland Univ., College Park) *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 328-336 refs (For primary document see N84-24115 14-64)
(AD-P002371) Avail: NTIS HC A19/MF A01 CSCL 12/1

A combinatorial mix valued algebra, denoted by Mx, operates on variables representing multivalued signals and buses of any width (including width = 1). A bus of signals is represented as a single multivalued variable. All variables in Mx can range over values and sets of values and are not required to range over the same set. The function set proposed for Mx includes relation, set theoretic, and existential operators. The usual two valued Boolean algebra is a subalgebra of Mx when all variables are binary and from the same set of values. Only combinatorial memoryless topics are discussed, but sequential and memory circuits composed of Mx operations are known. Mx is useful for compact technology independent representation of digital systems during the design process. GRA

N84-24163# Lockheed Missiles and Space Co., Sunnyvale, Calif.
A MINIMIZATION METHOD FOR ENGINEERING ESTIMATION c64
Suchitra Dhar *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 337-341 refs (For primary document see N84-24115 14-59)
(AD-P002372) Avail: NTIS HC A19/MF A01 CSCL 12/1

This paper contains a convergence criterium for optimal estimation by constructing a mathematical theory of ordering, based upon topological and algebraic concepts. This theory provides the model of minimizing the variance of error associated with the estimators of a true state. Thus it is a supplement to the classical Kalman filtering approach. The theory is first described in mathematical terms, as an ordering structure consisting of these entities: a non-empty set of estimators, a binary relation of comparison between estimators, and a closed binary operation that composes the estimators in some prescribed fashion. A triple consisting of these entities of an ordering structure, if and only if the axioms of weak order, associativity, monotonocity, and Archimedean property are satisfied. A weak representation theorem is stated regarding the existance of an order preserving real valued function on the set of estimators. GRA

N84-24164# Northwest Telecommunication Engineering Inst., Xian (China). Dept. of Information Engineering.
THE OPTIMIZATION OF GMC OVER GF(P) c64
Ping Dong *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 342-347 refs (For primary document see N84-24115 14-59)
(AD-P002373) Avail: NTIS HC A19/MF A01 CSCL 12/1

This paper deals with the obtaining and optimization of the Generalized Reed-Muller Canonical form (GMC) of p-valued logical functions. The basic ideas involved are the linear transforms of logical functions over GF(P) and the processing of the spectra thus obtained. The basic concern is with the convenience of the calculation rather than the analysis of the process, so that they can be easily implemented using a digital computer. GRA

N84-24165# Northwestern Univ., Evanston, Ill. Dept. of Electrical Engineering and Computer Science.
RELATIONS AMONG SYSTEM DIAGNOSIS MODELS WITH 3-VALUED TEST OUTCOMES c60
Jon T. Butler *In its* The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 350-355 refs (For primary document see N84-24115 14-59)
(Grant NSF ECS-82-03276)
(AD-P002374) Avail: NTIS HC A19/MF A01 CSCL 09/2

Three models of multiprocessing systems are compared on the basis of the accuracy of the diagnosis of faulty processors. One model is the conventional system with binary valued test outcomes (pass and fail). The other models have three valued test outcomes, where the third value is either a missing or an incorrect test result. It is shown that, in general multiprocessing systems, there is a hierarchy among the three models with respect to diagnosability. However, in systems where no two processors test each other, the models areon par, and established criteria for diagnosability in binary systems can be used in both of the three valued systems. GRA

N84-24166# University of Western Illinois, Macomb. Dept.. of Quantitative and Information Science.
ON SYSTEM DIAGNOSIS WITH MULTIVALUED TEST OUTCOMES c64
A. Sen Gupta and A. Sen (Indian Statistical Inst., Calcutta) *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 356-360 refs (For primary document see N84-24115 14-59)
(AD-P002375) Avail: NTIS HC A02/MF A01 CSCL 12/1

The problem of diagnosis of systems when the test outcomes are multivalued was considered earlier. However, a too strong sufficient condition was specified there for the diagnosability of such a system, which was shown not be a necessary one. Necessary and sufficient conditions for the diagnosability of a system under multivalued test outcomes have been presented in this paper which is applicable to any arbitrary system. GRA

N84-24167# Poznan Technical Univ. (Poland). Regional Computer Center.
A METHOD OF TEST GENERATION FOR VERIFICATION OF WIRING CORRECTNESS c64
Krzysztof Bucholc *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 361-364 refs (For primary document see N84-24115 14-59)
(AD-P002376) Avail: NTIS HC A19/MF A01 CSCL 12/1

The paper presents a method of test generation for any multiterminal wiring network, such as printed circuit board, computer backpanel wiring, etc. The method is based on the minimization of the test generated by examining the correct network with computer controlled tester. Three valued algebra was used. In comparison with more straightforward algorithm based on the adjacency matrix, lower space complexity has been achieved O(n) rather than O(sq. n). GRA

N84-24168# Illinois Inst. of Tech., Chicago.
AUTOMATED DESIGN OF COMBINATIONAL NETWORKS UNDER SPECIFIC CONSTRAINTS: A THEOREM PROVING APPROACH c33
Waldo C. Kabat *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 366-396 refs Sponsored in part by NSF (For primary document see N84-24115 14-59)
(Contract W-31-109-eng-38)
(AD-P002377) Avail: NTIS HC A19/MF A01 CSCL 09/5

An automated theorem proving system is seen as a viable addition to the set of traditional design automation tools. The automated design of combinational network for an arbitrary switching function can be performed using theorem proving techniques. Additional constraints such as modularity, design under the requirements of a particular technology, and the fault tolerant logic design can be imposed upon the design. Author (GRA)

N84-24169# Bell Telephone Labs., Inc., Naperville, Ill.
SYNTHESIS OF MULTIPLE-VALUED LOGIC FUNCTIONS BASED ON A MODULAR DESIGN APPROACH c33
Kwang-Ya Fang and Anthony S. Wojcik (Illinois Inst. of Technology, Chicago) *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 397-407 refs (For primary document see N84-24115 14-59)
(Grant NSF MCS-79-01689)
(AD-P002378) Avail: NTIS HC A19/MF A01 CSCL 09/5

As a multiple valued logic technology advanced rapidly, it is desirable to develop more cost effective designs that effectively

make use of the modular design techniques. A decomposition approach to the modular design of multiple valued logic functions was presented previously by the authors. Based on this approach, systematic procedures are developed with simplification techniques which reduce the number of modules required in the design. The first step involves the process of partitioning functions into classes. Then, the representative building blocks for each function class are implemented using T-gates as the basic component. Design procedures are developed, so that all the functions in each class can be implemented directly by the representative building block. GRA

N84-24170# West Virginia Univ., Morgantown. Dept. of Electrical Engineering.

SYNTHESIS ALGORITHM FOR MINIMAL COMPONENTS IN T-ULM NETWORKS **c33**

Powsiri Klinkhachorn and Robert Swartwout *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 408-413 refs (For primary document see N84-24115 14-59)

(AD-P002379) Avail: NTIS HC A19/MF A01 CSCL 09/5

An algorithm has been developed and programmed in Pascal to design T-ULM networks for MVL systems with up to 6 r-valued inputs (r from 2 to 5). The algorithm is based on a special form of T-ULM formed from threshold detectors and switches. The objective of the algorithm is to minimize the total number of components (thresholds and switches) and also the total number of T-ULM's. Techniques are presented that make optimal use of don't care conditions in the functional specification. GRA

N84-24171# Bristol Univ. (England). Dept. of Engineering Mathematics.

A FUZZY RELATIONAL INFERENCE LANGUAGE FOR EXPERT SYSTEMS **c60**

J. F. Baldwin *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 416-421 refs (For primary document see N84-24115 14-59)

(AD-P002380) Avail: NTIS HC A19/MF A01 CSCL 09/2

A fuzzy relational inference language, F.R.I.L., is discussed in related relationship to its application for designing intelligent knowledge bases and expert systems. It is a high level query language with automatic reasoning and is based upon fuzzy set and relation theories. GRA

N84-24172# Hangzhou Univ. (China). Dept. of Physics.

THE SYNTHESIS OF TERNARY FUNCTIONS UNDER FIXED POLARITIES AND TERNARY I-2L CIRCUITS **c33**

X. Chen and X. Wu *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 424-429 refs (For primary document see N84-24115 14-59)

(AD-P002381) Avail: NTIS HC A19/MF A01 CSCL 09/5

This paper discusses the expansion of multiple value functions based upon modulo-algebra and Kronecker product. A transforms algorithm of the expansion coefficients of various polarities, and their minimization are proposed. Ternary function realizations using I2L technology are finally considered. Author (GRA)

N84-24173# Army Research Office, Research Triangle Park, N.C.

TRANSACTIONS OF THE 1ST ARMY CONFERENCE ON APPLIED MATHEMATICS AND COMPUTING, HELD AT WASHINGTON, D.C., 9-11 MAY 1983

Feb. 1984 948 p

(AD-A139224; AD-E900330; ARO-84-1) Avail: NTIS HC A99/MF A01 CSCL 12/1

Various topics on applied mathematics and computing are discussed. Numerical flow simulation, vehicle dynamic analysis, diagnostic algorithms for contour dynamics, a finite difference method for any partial differential equation, and decision algorithms in fuzzy situations are among the topics discussed. For individual titles, see N84-24174 through N84-24216.

N84-24174# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Mathematical Sciences.

ASYMPTOTICS AND NUMERICS **c64**

J. D. Cole *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 1-26 Prepared in cooperation with Minnesota Univ., Minneapolis (For primary document see N84-24173 14-59)

(AD-P002934) Avail: NTIS HC A99/MF A01 CSCL 12/1

Limit process expansions applied to problems for partial differential equations are discussed. Three different types of non-uniformities, non-linear far field, non-linear local singularity, and singular boundary conditions are illustrated by example. The use of different limits to construct overlapping expansions is emphasized. Matching is sketched briefly. GRA

N84-24175# Wisconsin Univ., Madison. Mathematics Research Center.

INSTABILITY OF THE FLOW OF TWO IMMISCIBLE LIQUIDS WITH DIFFERENT VISCOSITIES IN A PIPE **c34**

D. D. Joseph, M. Renardy, and Y. Renardy *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 27-36 (For primary document see N84-24173 14-59)

(Contract DAAG29-80-C-0041)

(AD-P002935) Avail: NTIS HC A99/MF A01 CSCL 20/4

We study the flow of two immiscible fluids of different viscosities and equal density through a pipe under a pressure gradient. This problem has a continuum of solutions corresponding to arbitrarily prescribed interface shapes. The question therefore arises which of these solutions are stable and thus observable. Experiments have shown a tendency for the thinner fluid to encapsulate the thicker one. This has been explained by the viscous dissipation principle, which postulates that the amount of viscous dissipation is minimized for a given flow rage. For a circular pipe, this predicts a concentric configuration with the more viscous fluid located at the core. A linear stability analysis, which is carried out numerically, shows that while this configuration is stable when the more viscous fluid occupies most of the pipe it is not stable when there is more of the thin fluid. Therefore the dissipation principle does not always hold, and the volume ratio is a crucial factor. GRA

N84-24176# Ballistic Research Labs., Aberdeen Proving Ground, Md.

NUMERICAL SIMULATION OF THE FLOW OF A CHEMICAL CONTAMINANT SUBJECTED TO A JET IMPINGEMENT **c34**

L. M. Chang *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 37-53 (For primary document see N84-24173 14-59)

(AD-P002936) Avail: NTIS HC A99/MF A01 CSCL 20/4

A numerical simulation and study are presented for characterization of the interaction flow of a water jet with a chemical contaminant droplet on a plane wall, which occurs in chemical decontamination processes. The model for this analysis is a two-dimensional, two-fluid flow governed by the Navier-Stokes equations. Emphases of the study are on the evolution of the contaminant droplet and the effects of variation of relevant flow parameters on the displacement of the contaminant. Computed results show that a jet impingement at an angle of incidence in the range of 45 deg - 60 deg can achieve the highest cleaning speed of the contaminant. The results area can greatly improve the cleaning speed. However, for a given jet flow rate, it is more advantageous to increase the jet velocity rather than the cross-sectional area in order to increase the efficiency of the use of jet fluid. Author (GRA)

N84-24177# Minnesota Univ., Minneapolis. Dept. of Aerospace Engineering and Mechanics.

NONUNIQUENESS AND STABILITY OF THE CONFIGURATION OF FLOW OF IMMISCIBLE FLUIDS WITH DIFFERENT VISCOSITIES **c34**

D. D. Joseph, K. Nguyen, and G. S. Beavers *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 55-115 (For primary document see N84-24173 14-59)

(AD-P002937) Avail: NTIS HC A99/MF A01 CSCL 20/4

The arrangement of components in steady flow of immiscible liquids is typically nonunique. The problem of selection of arrange-

ments is defined and studied by variational methods under the hypothesis that the realized arrangements are either those which maximize the speed on exterior boundaries for prescribed boundary tractions or those which minimize the tractions for prescribed speeds. The arrangements which minimize tractions also minimize dissipation by putting low viscosity liquid (LVL) in regions of high shear. The variational problem is used as a guide to intuition in design and interpretation of experiments when results of analysis of stability are unavailable. We always observe some kind of shielding of high viscosity liquid (HVL). This can occur by sheet coating in which LVL encapsulates HVL, or through the formation of rigidly rotating masses of which we call rollers. In other cases we get emulsions of LVL in a high viscosity foam. The emulsions arise from a fingering instability. The LVL fingers into the HVL and then low viscosity bubbles are pinched off the fingers. The emulsions seem to have a very low effective viscosity and they shield the HVL from shearing. In the problem of Taylor instability with two fluids low viscosity Taylor cells are separated by stable high viscosity rollers. GRA

N84-24178# Wisconsin Univ., Madison.
FLOW PAST A FLEXIBLE MEMBRANE **c34**
J. M. Vanden-Broeck *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 117-123 (For primary document see N84-24173 14-59)
(Contract DAAG29-80-C-0041; Grant NSF MCS-80-01960)
(AD-P002938) Avail: NTIS HC A99/MF A01 CSCL 20/4

The deformation of a two-dimensional membrane due to the flow of an incompressible fluid around it is considered. The membrane is assumed to be flexible and inextensible. The problem is related to the flow of air past parachutes. Numerical solutions are obtained by discretization of the model nonlinear integrodifferential equation describing the flow. The numerical results are shown to be in reasonable agreement with experiments. In addition some aspects of the effect of porosity are discussed. Author (GRA)

N84-24179# Iowa Univ., Iowa City. Coll. of Engineering.
VEHICLE DYNAMIC ANALYSIS WITH FLEXIBLE COMPONENTS **c37**
S. S. Kim, A. A. Shabana, and E. J. Haug *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 125-142 (For primary document see N84-24173 14-59)
(Contract DAAG29-82-K-0086)
(AD-P002939) Avail: NTIS HC A99/MF A01 CSCL 13/6

A method is presented for nonlinear, transient dynamic analysis of vehicle systems that are composed of interconnected rigid and flexible bodies. The finite element method is used to characterize deformation of each elastic body and a component mode technique is employed to reduce the number of elastic generalized coordinates. Equations of motion and constraints of the coupled system are formulated in terms of a minimal set of modal and reference generalized coordinates. A Lagrange multiplier technique is used to account for kinematic constraints between bodies and a generalized coordinate partitioning technique is employed to eliminate dependent coordinates. The method is applied to a planar truck model with a flexible chassis and nonlinear suspension components. Simulation results for transient dynamic response as the vehicle traverses a bump, including the effect of bump-stops, and random terrain show that flexibility of the chassis can be routinely accounted for and predicts significant effects on vibratory motion of the vehicle. Compared with a rigid body model, flexibility of the chassis increases peak acceleration of the chassis and induces high frequency vertical acceleration in the range of human resonance, which deteriorates ride quality of off-road vehicles. Author (GRA)

N84-24180*# Wisconsin Univ., Madison. Mathematics Research Center.
APPLICATION OF SYMBOLIC COMPUTATION TO THE ANALYSIS OF MECHANICAL SYSTEMS, INCLUDING ROBOT ARMS **c64**
M. A. Hussain and B. Noble *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 143-166 Prepared in cooperation with General Electric Co., Syracuse, N.Y. (For primary document see N84-24173 14-59)
(Grant NsG-1323; Contracts ET-78-C-02-4687; N00014-77-C-0641)
(AD-P002940) Avail: NTIS HC A99/MF A01 CSCL 12A

This paper illustrates the application of symbolic computation in connection with three aspects of mechanical systems: (1) The derivation of dynamical equations by Lagrangian methods; (2) The analysis and synthesis of kinematic mechanisms; and (3) A robot manipulator arm. GRA

N84-24181# Atlanta Univ., Ga. Dept. of Mathematical and Computer Sciences.
ON THE CONVERSION OF LINPACK TO ADA **c61**
B. J. Martin and R. Bozeman *In* Army Research Office Trans. of the 1st Army Conf. on Appl. and Computing Feb. 1984 p 167-176 Prepared in cooperation with Morehouse Coll., Atlanta, Ga. (For primary document see N84-24173 14-59)
(AD-P002941) Avail: NTIS HC A99/MF A01 CSCL 09/2

The authors demonstrate the feasibility of converting the LINPACK routines for analyzing and solving systems of linear algebraic equations from FORTRAN to Ada. This is done with minimal alteration of the original program structure, thus requiring very little re-orientation by current users of LINPACK. Sample programs are included. Author (GRA)

N84-24182# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
ON THE EXTREMUM OF BILINEAR FUNCTIONAL FOR HYPERBOLIC TYPE P.D.E. **c64**
C. N. Shen *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 211-236 (For primary document see N84-24173 14-59)
(AD-P002942) Avail: NTIS HC A99/MF A01 CSCL 12/1

Transient solutions of the hyperbolic-type partial differential equations are needed for solving many engineering problems such as computing stress waves for gun dynamics or determining shock behaviors of penetration mechanics. Variational procedures using the bilinear formulations with adjoint variables can serve as the theoretical basis in the derivation of algorithms for the finite element methods, giving direct numerical solutions for partial derivatives of the functions to be found for these problems. The adjoint system can be arranged in a manner that it is a reflected mirror of the original system in time. Generalized boundary conditions employ many types of springs relating the various spatial partial derivatives. They are defined to satisfy the boundaries of the concomitant for the bilinear expression. Algorithms for use in the finite element method are simplified since the adjoint system gives exactly the same solutions as that of the original system. The second necessary condition for an extremum is satisfied by showing that the second variation is positive semi-definite. Author (GRA)

N84-24183# Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Ballistic Research Lab.
THE INFLUENCE OF CUTOUTS ON TRANSIENT RESPONSE OF HEMISPHERICAL SHELLS **c39**
A. D. Gupta and H. L. Wisniewski *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 237-244 (For primary document see N84-24173 14-59)
(AD-P002943) Avail: NTIS HC A99/MF A01 CSCL 12/1

To evaluate performance of enclosure structures due to an internal blast, the dynamic response of a continuous hemispherical configuration has been compared to the response of the same configuration, but with a large access opening. The results indicate substantial alteration of the response behavior and stress concentration effects in the vicinity of the cutout region. Author (GRA)

N84-24184# New York Univ., New York. Inst. of Mathematical Sciences.
THE COUPLING OF TRACKED AND INTERIOR WAVES IN A FRONT TRACKING SCHEME **c64**
J. Glimm, O. McBryan, B. Plohr, and S. Yaniv *In* Army Res.

Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 245-253 (For primary document see N84-24173 14-59)
(Contract DAAG29-83-K-0007; Grant NSF MCS-82-07965)
(AD-P002944) Avail: NTIS HC A99/MF A01 CSCL 12/1

Front tracking is a method for numerical solution of hydrodynamical problems whose basic element is a system of moving curves (i.e., the front). Each curve represents a physical wave. For gas dynamics, these waves are either shock waves (nonlinear sound waves) or contact discontinuities (temperature jumps or slip lines). In a front tracking scheme certain waves are given a more exact treatment through the introduction of a dynamically moving, lower dimensional grid that is aligned with the wave fronts. These tracked waves are propagated in time through the solution of Rankine-Hugoniot relations; the remaining waves are propagated using finite difference equations, This paper discusses the coupling between these two wave systems. GRA

N84-24185# California Univ., Los Angeles. Dept. of Mathematics.
RIEMANN SOLVERS, THE ENTROPY CONDITION AND HIGH RESOLUTION DIFFERENCE APPROXIMATIONS **c67**
S. Osher *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 255-257 (For primary document see N84-24173 14-59)
(Grant DAAG29-82-G-0090)
(AD-P002945) Avail: NTIS HC A99/MF A01 CSCL 12/1

A condition on the numerical flux for approximations to scalar, non-convex conservation laws is introduced, and shown to guarantee convergence to the correct physical solution. These considerations lead to a simple, closed form, analytic expression for the solution to the Riemann problem for scalar, nonconvex, conservation laws. A systematic approach is presented for converting these first order accurate convergent approximations to second order accurate, variation diminishing, entropy condition, satisfying approximations. The technique is extended to systems of equations of inviscid, compressible flow in general geometries, using a high resolution version of the author's scheme. GRA

N84-24186# Texas Univ., Austin. Dept. of Aerospace Engineering and Engineering Mechanics.
ARTIFICIAL MASS CONCEPT AND TRANSONIC VISCOUS FLOW EQUATION **c02**
G. S. Dulikravich and P. Niederdrenk *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 259-268 (For primary document see N84-24173 14-59)
(AD-P002946) Avail: NTIS HC A99/MF A01 CSCL 12/1

By varying the grid clustering on the surface of an airfoil, it was observed that symmetric shocked solutions develop with a nonunique shock strength and location when numerically solving the full potential equation. It is shown analytically that the conventional form of artificial density (or viscosity) produces a number of truly nonlinear terms which are suspected to be the cause of the nonuniqueness for all the finite grid sizes. A concept of artificial mass flow is shown to be suitable for analytically evaluating a new exact form of the switching function that eliminates all the nonlinear terms for any value of the local Mach number. The resulting expanded full potential equation then becomes a third order partial differential equation of permanently parabolic type resembling Sichel's transonic viscous flow equation. Consequently, our expanded full potential equation does not require the introduction of the customarily-used artificial time concept.
Author (GRA)

N84-24187# Pittsburgh Univ., Pa. Dept. of Mathematics and Statistics.
DIAGNOSTIC ALGORITHMS FOR CONTOUR DYNAMICS **c61**
E. A. Overman, II and N. J. Zabusky *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 269-287 (For primary document see N84-24173 14-59)
(AD-P002947) Avail: NTIS HC A99/MF A01 CSCL 12/1

The goal of large scale numerical simulations (numerical experiments) is to obtain a quantitative understanding of complicated nonlinear dynamical processes. A proper picture or graph can spark in-the prejudices of conservative intuitions. Diagnostic algorithms and their graphs are particularly useful in the contour dynamics model for studying two-dimensional fluid dynamics. This is because the 2D densities are replaced by contours bounding piecewise-constant density regions (i.e., 1D curves). Thus our diagnostic parameters are functions of one variable, the arc length along each curve, and their graphs are 2D. We discuss and illustrate some time-dependent properties of planar curves, including the spatial plot, low order moments, perimeter, curvature, and Fourier transforms. We also apply these techniques to contours obtained from finite-difference representations of continuum systems. GRA

N84-24188# Georgia Inst. of Tech., Atlanta. School of Mathematics.
ANALYSIS OF THE VON KARMAN EQUATIONS BY GROUP METHODS **c64**
K. A. Ames and W. F. Ames *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 289-299 Prepared in cooperation with Iowa State Univ., Ames (For primary document see N84-24173 14-59)
(Contract DAAG29-81-K-0042)
(AD-P002948) Avail: NTIS HC A99/MF A01 CSCL 12/1

One of the system of equations approximating the large deflection of plates consists of two coupled nonlinear fourth order partial differential equations, known as the von Karman equations. The fully symmetry group for the steady equations is a finitely generated Lie group with ten parameters. For the time dependent system the full symmetry group is an infinite parameter Lie group. Several subgroups of the full group are used to generate exact solutions of the time-independent and the time-dependent system. These include the dilatation group (similar solutions), rotation group, screw group and others. Physical implications and applications are discussed. Author (GRA)

N84-24189# Wayne State Univ., Detroit, Mich. Dept. of Mathematics.
ON THE CONTROL OF A LINEAR STOCHASTIC SYSTEM WITH FINITE HORIZON **c63**
P. L. Chow and J. L. Menaldi *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 301-310 (For primary document see N84-24173 14-59)
(Contract DAAG29-83-K-0014)
(AD-P002949) Avail: NTIS HC A99/MF A01 CSCL 12/1

We consider a dynamic system whose state is governed by a linear stochastic differential equation with time-dependent coefficients. The control acts additively on the state of the system. Our objective is to minimize an integral cost which depends upon the evolution of the state and the total variation of the control process. It is proved that the optimal cost is the unique solution of an appropriate free boundary problem in a space-time domain. By using some decomposition arguments, the problems of a two-sided control, i.e., optimal corrections, and the case with constraints on the resources, i.e., finite fuel, can be reduced to a simpler case of only one-sided control, i.e., a monotone follower. These results are applied to solving some examples by the so-called method of similarity solutions. Author (GRA)

N84-24190# Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Ballistic Research Lab.
NON-LINEAR MULTIDIMENSIONAL MODELS, LEAST SQUARES AND REDUCED RESIDUALS **c64**
A. Celmins *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 405-430 (For primary document see N84-24173 14-59)
(AD-P002950) Avail: NTIS HC A99/MF A01 CSCL 12/1

This paper addresses the treatment of such model fitting problems that include an analysis of the residuals, for instance to determine heteroscedasticity. In cases with multidimensional observations the residuals are vectors having model induced correlations between components. It is shown that one can eliminate such correlations and also reduce the number of residual components by introducing a concept of reduced residuals. The

application of the new concept is illustrated by an investigation of heteroscedasticity of vapor pressure measurements. Author (GRA)

N84-24191# White Sands Missile Range, N.Mex.
APPLICATION OF THE PRINCIPAL COMPONENT METHOD TO TRAJECTORY ESTIMATION **c64**
W. S. Agee and R. H. Turner *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 431-441 (For primary document see N84-24173 14-59)
(AD-P002951) Avail: NTIS HC A99/MF A01 CSCL 12/1

Measurements of range, azimuth, and elevation from several different radars are used to estimate the cartesian position coordinates of a vehicle trajectory at a sequence of times, t sub i, i=1N which cover the entire trajectory. Since the measurements are subject to systematic errors as well as random measurement errors, we also want to estimate the systematic error parameters or biases in addition to the trajectory coordinates. The resulting estimation problem is a combined linear and nonlinear estimation problem in which the trajectory coordinates appear as nonlinear parameters in the measurements and the biases appear as linear parameters in the measurements. Applications of principal components regression methods are discussed. GRA

N84-24192# IBM Federal Systems Div., Owego, N. Y.
OPTIMAL REDUCED ORDER CONTROLLERS FOR DISCRETE-TIME LINEAR SYSTEMS WITH PARTIAL STATE ESTIMATION **c64**
M. F. Hutton *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 443-454 (For primary document see N84-24173 14-59)
(AD-P002952) Avail: NTIS HC A99/MF A01 CSCL 12/1

The solution to the standard steady state LQG problem is a controller whose order equals the order of the plant model. For many high order plant models, a reduced order controller which is easier to mechanize can be used with good performance. A methodology is described for solving the discrete-time, steady state LQG problem with the constraints that the controller be of reduced order and that linear combinations of the controller states estimate particular plant model state variables. Formulas for simplifying the gradient calculations are introduced. Author (GRA)

N84-24193# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Lab.
HIGH VALUE TARGET MODELING FOR TACTICAL DECISION AIDS **c74**
R. A. Weiss and L. E. Link *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 455-476 (For primary document see N84-24173 14-59)
(AD-P002953) Avail: NTIS HC A99/MF A01 CSCL 20/6

As part of a program to select an optimal tactical weapon system for specified environmental conditions a procedure is presented for predicting the apparent infrared image of a target in a background that would be seen by an infrared sensor in a missile or airplane. Environmental effects are introduced through the exchange of energy between the target, atmosphere, and background by radiation, conduction, convection, and latent heat. The diurnal variation of the temperature and radiance of target and background surfaces are calculated including the effect of target orientation relative to the Sun. Numerical calculations are presented for temperatures and radiances of the facets of a petroleum storage tank. Author (GRA)

N84-24194# North Carolina State Univ., Raleigh.
ORTHOGONAL SCHEMES FOR STRUCTURAL OPTIMIZATION **c64**
M. W. Berry, M. T. Heath, R. J. Plemmons, and R. C. Ward *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 477-485 Prepared in cooperation with Union Carbide Corp., Greenville, S.C. and ORNL, Tenn. (For primary document see N84-24173 14-59)
(Contracts DAAG29-81-K-0132; W-7405-eng-26; Grant AF-AFOSR-0255-83)
(AD-P002954) Avail: NTIS HC A99/MF A01 CSCL 12/1

Historically there are two principal methods of matrix structural analysis, the displacement (or stiffness) the force method has been used relatively little because the displacement method has been deemed easier to implement on digital computers, especially for large sparse systems. The force method has theoretical advantages, however, for multiple redesign problems or nonlinear elastic analysis because it allows the solution of modified problems without restarting the computation from the beginning. In this paper we give an implementation of the first phase of the force method which is numerically stable and preserves sparsity. A primary feature of our work is the development of an efficient algorithm for computing a banded basis for the null space by orthogonal decomposition. Numerical test comparisons for several practical structural analysis problems are provided. Author (GRA)

N84-24195# Army Materials and Mechanics Research Center, Watertown, Mass.
THREE DIMENSIONAL STRESS ANALYSIS OF AN ARTILLERY PROJECTILE JOINT **c39**
T. Y. Tsui, M. L. Chiesa, and M. L. Callabresi *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 487-497 (For primary document see N84-24173 14-59)
(AD-P002955) Avail: NTIS HC A99/MF A01 CSCL 12/1

This study presents the results of a three-dimensional elastic plastic dynamic stress analysis of one of the structural joints encountered in artillery projectiles. The particular spline joint analyzed has equally spaced set screws around the surface of the projectile. In general, these types of structural joint problems are variable contact problems in that the interaction between the set screws and their bearing surface along with the interaction between the interfaces of the joint are nonlinear in nature. Due to the complexity of the structural configuration and loading of the joint, the finite element method has been used to solve the problem. The numerical analysis covers the time from initial launching to barrel exit. Stresses and deformations in the joint are determined at various stages of loading. The effect of the set screw holes on the stress distributions in the joint is examined in detail.
Author (GRA)

N84-24196# Army Armament Research and Development Command, Dover, N. J. Fire Control and Small Caliber Weapon Systems Lab.
A SIMPLE APPROACH FOR DETERMINATION OF BURSTING PRESSURE OF A THICK-WALLED CYLINDER **c37**
S. C. Chu *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 499-520 (For primary document see N84-24173 14-59)
(AD-P002956) Avail: NTIS HC A99/MF A01 CSCL 12/1

By using the true-stress true-strain relation, a simple finite-strain incompressible analytical solution technique is developed to predict pressure deformation relations up to the failure of thick-walled cylinders subjected to internal pressure. The material is assumed to be an isotropic hardening material that obeys the von Mises yield condition. The flow law for the material incorporates the Prandtl-Reuss stress-strain relations and a loading function represented by the true-stress versus true-strain diagram. Poisson's ratio is assumed to be equal to one-half for both elastic and plastic strains. The bursting pressure for thick-walled cylinders made of either SAE 1045 steel or copper is presented graphically for various ratios of outer and inner radii of undeformed cylinders. The true location of inner surface of cylinders made of both metals at various pressure levels was determined and presented graphically. Pressure expansion curves for cylinders made of SAE 1045 steel and OFHC copper are presented. Author (GRA)

N84-24197# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
STRESS DISTRIBUTION IN A CYLINDRICAL BAR SUBJECTED TO CYCLIC TORSIONAL LOADING **c39**
P. C. T. Chen and H. C. Wu *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 521-533 (For primary document see N84-24173 14-59)

(AD-P002957) Avail: NTIS HC A99/MF A01 CSCL 12/1

The modified version of the endochronic theory of plasticity is applied to the problem of a cylindrical bar subjected to cyclic fully-reversed torsional loading. The governing equations of integral form are derived for pure shear deformation. Analytical techniques are employed in the solution of these equations. A material with appreciable cyclic hardening behavior is studied. The shear stress-strain curve of such a material under a strain-controlled condition is presented for all cycles until a steady loop is reached. The stress distributions in a cylindrical bar at different stages of loading and unloading are calculated. Some numerical results are presented. Author (GRA)

N84-24198# Army Cold Regions Research and Engineering Lab., Hanover, N. H.

A FINITE INTEGRAL TRANSFORM (FIT) METHOD FOR DIFFERENTIAL EQUATIONS HAVING ASYMPTOTIC SOLUTIONS **c64**

C. J. Daly *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 551-558 (For primary document see N84-24173 14-59)

(AD-P002958) Avail: NTIS HC A99/MF A01 CSCL 12/1

An analytical method is developed for differential equations whose solutions y(t) decay asymptotically for large t. The approach, called the finite integral transform (FIT) method, is based upon the use of selected transform-inverse pairs for which the inverses are known explicitly. Using the method, approximate analytical expressions for y(t) are obtained in the form of series of orthogonal functions psi sub n (t). Asymptotic behavior of the approximating series is guaranteed by requiring each psi sub n t be asymptotic for large t. The central feature of the FIT approach is the generation of a system of algebraic equations which is solved for the vector of coefficients appearing in the orthogonal series solution. The FIT method amounts to a discretization of the unknown solution in a frequency domain. This is in contrast to finite difference and finite element methods which discretize over the domain of independent variables. The FIT approach is demonstrated by application to a simple linear ODE with variable coefficient.

Author (GRA)

N84-24199# Army Armament Research and Development Command, Dover, N. J. Fire Control and Small Caliber Weapon Systems Lab.

A FINITE DIFFERENCE METHOD FOR ANY PARTIAL DIFFERENTIAL EQUATION **c64**

R. Yalamanchili *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 559-566 (For primary document see N84-24173 14-59)

(AD-P002959) Avail: NTIS HC A99/MF A01 CSCL 12/1

The most general heat diffusion equation possesses not only first and second order derivatives in space but also first and second order derivatives in time. Therefore, the governing equation can be parabolic, elliptic or even hyperbolic depending upon the parameters chosen. The model includes various physical problems, such as, steady and unsteady classical heat conduction (usually known as classical Fourier model), heat pulse (non-Fourier model), abrasive cut-off and surface grinding operations in machining of metal components. An explicit and unconditionally stable finite difference scheme is developed for the general purpose governing equation. The heat transfer example is included to discuss the accuracy and stability of this numerical scheme. Author (GRA)

N84-24200# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mathematics.

NUMERICAL BOUNDARY CONDITIONS FOR FLOW PROBLEMS **c34**

G. J. Fix and M. D. Gunzburger *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 567-580 (For primary document see N84-24173 14-59)

(Contract DAAG29-83-K-0084)

(AD-P002960) Avail: NTIS HC A99/MF A01 CSCL 12/1

The development, analysis, and implementation of numerical boundary conditions for flow calculations in infinite domains are discussed. Emphasis is placed on potential flow, periodic acoustic, and incompressible viscous flow problems. In all cases, the infinite domain problems are approximated by problems posed on a bounded domain. To close the numerical problem, an artificial numerical boundary condition is imposed. The effect of these approximate boundary conditions on the accuracy of the numerical computations is examined. Author (GRA)

N84-24201# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mathematics.

LEAST SQUARES APPROXIMATIONS TO COMPRESSIBLE FLOW PROBLEMS **c34**

G. J. Fix and M. D. Gunzburger *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 581-585 (For primary document see N84-24173 14-59)

(Contract DAAG29-83-K-0084)

(AD-P002961) Avail: NTIS HC A99/MF A01 CSCL 12/1

A type insensitive scheme based on a weighted least square variational principle is used in conjunction with appropriate finite element spaces. Shocks are treated through a modified density formulation natural to this scheme. Selected numerical results are reported along with a qualitative analysis of the approximations.

Author (GRA)

N84-24202# Ni-Tec, Inc., Niles, Ill.

AN INTRODUCTION TO GEOMETRIC PROGRAMMING **c61**

P. D. Allen and D. W. Baker *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 587-600 Prepared in cooperation with Getty Oil Co., Los Angeles (For primary document see N84-24173 14-59)

(AD-P002962) Avail: NTIS HC A99/MF A01 CSCL 12/1

Geometric Programming (GP) can solve two types of problems: non-linear minimization formulations and simultaneous are non-linear, there are numerous potential applications. Furthermore, GP can provide the general solution to a given non-linear problem if the problem is reduced to what is called zero degrees of difficulty. Sample solutions to some problems are provided. Author (GRA)

N84-24203# Atlanta Univ., Ga. Dept. of Mathematical and Computer Sciences.

SPACE AND TIME ANALYSIS IN DYNAMIC PROGRAMMING ALGORITHMS **c61**

N. A. Warsi and C. B. Setzer *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 601-604 (For primary document see N84-24173 14-59)

(AD-P002963) Avail: NTIS HC A99/MF A01 CSCL 09/2

Dr. Nazir Warsi, in recent work, showed how to solve certain dynamic programming problems while keeping strict bounds on the amount of working storage needed. We discuss extensions of Dr. Warsi's methods and anlaysis to more general dynamic programming networks. We describe a general algorithm for solving problems in this more general class. This algorithm may be applied in such a way as to limit working storage arrays to any dimensions greater than or equal to 2. In making this restriction, there are two costs: a number of arrays of dimension 2 may need to be stored simultaneously; searches for maxima can become arbitrarily complex with the complexity of the network. We discuss the implementation of the general algorithm in a higher level language with particular emphasis on storage management. We also discuss data representations and the practicality of implementing a system for handling general networks. Author (GRA)

N84-24204# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Civil Engineering.

A NUMERICAL TECHNIQUE IN THE HYDRODYNAMIC THEORY OF FOIL BEARINGS **c37**

I. G. Tadjbakhsh, G. Ahmadi, and E. A. Saibel *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 659-677 Prepared in cooperation with Clarkson Coll., Potsdam, N.Y. (For primary document see N84-24173 14-59)

(AD-P002966) Avail: NTIS HC A99/MF A01 CSCL 12/1

The hydrodynamic theory of foil bearings is reviewed. The relationship between fluid pressure and film thickness is discussed.

The compressibility of gas is included in the analysis. It is shown that the basic equation for determination of pressure distribution becomes a third order boundary value problem in terms of film thickness. A simple numerical scheme for solution of the nonlinear boundary value problem is developed and some examples are considered and discussed. Author (GRA)

N84-24205# Technische Hochschule, Aachen (West Germany).
DECISION ALGORITHMS IN FUZZY SITUATIONS **c61**
H. J. Zimmermann *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 705-733 (For primary document see N84-24173 14-59)
(AD-P002968) Avail: NTIS HC A99/MF A01 CSCL 12/1

Classical decision models and algorithms are either dichotomous in character (feasible - nonfeasible, optimal not optimal) or they are stochastic. There are, however, many decision making situations which are illstructured or vague and which cannot properly be modelled by use of classical tools. Fuzzy set theory has been put forward as a possible bridge between models and reality in such vaguely described situations. More than 4000 publications are available in the area of fuzzy set theory and its applications. Of particular interest for fuzzy set modelling seems to be the area of decision making. Algorithmic approaches such as fuzzy linear programming as well as results of axiomatic and empirical research and their application to civilian and military problems are presented. Author (GRA)

N84-24206# Science Applications, Inc., Pleasanton, Calif.
MOVING FINITE ELEMENT RESEARCH FOR SHOCK HYDRODYNAMICS, CONTINUUM MECHANICS AND COMBUSTION **c34**
R. J. Gelinas, S. K. Doss, and N. N. Carlson *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 753-772 (For primary document see N84-24173 14-59)
(AD-P002970) Avail: NTIS HC A99/MF A01 CSCL 12/1

The overall objective of this research is to investigate the numerical properties and structure of the moving finite element (MFE) method in order to reduce it to practice for the numerical solution of important PDE systems. This research focusses upon mathematical and computational properties of transient MFE solutions in 1-D and 2-D of (i) the full viscous, compressible Navier-Stokes equations for shocks and possibly for combustion processes in gases; and (ii) the continuum equations for impacts of initially solid bodies where constitutive models include elastic, plastic, and visco plastic effects. In this work, primary attention is devoted to the distinction and exacting resolution of actual physical dissipation effects (over highly disparate scales) vis-a-vis numerical dissipation effects which frequently obscure the actual physical dissipation processes in PDE solutions of fluid dynamics equations. Test cases which demonstrate these distinctions are presented. Those factors which are major determinates of grid node optimality in the MFE method and in certain other adaptive solution methods for PDE's are discussed. GRA

N84-24207# Catholic Univ. of America, Washington, D.C. Dept. of Physics.
ELASTIC WAVE SCATTERING FROM CYLINDRICAL CAVITIES AND SOLID INCLUSIONS ANALYZED BY THE RESONANCE METHOD **c34**
P. P. Delsanto, J. D. Alemar, A. Nagl, J. V. Subrahmanyam, and H. Uberall *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 773-784 (For primary document see N84-24173 14-59)
(AD-P002971) Avail: NTIS HC A99/MF A01 CSCL 12/1

The formalism for a complete treatment of elastic wave scattering from cylindrical cavities and solid inclusions has been worked out for both perpendicular and oblique indice. Special cases, e.g., fluid cylinders enclosed in fluid or solid media, have already been numerically analyzed. Poles of scattering amplitudes in the complex frequency plane have been found, and were physically interpreted in terms of helical surface waves on the cylinders propagating in both the interior and the exterior medium. Dispersion, attenuation and refraction of these surface waves have been obtained. Author (GRA)

N84-24208# Rensselaer Polytechnic Inst., Troy, N. Y.
STABILITY OF PLANE NEAR-EQUIDIFFUSIONAL FLAMES WITHOUT INVOKING THE CONSTANT-DENSITY APPROXIMATION **c25**
T. Jackson and A. Kapila *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 785-789 (For primary document see N84-24173 14-59)
(AD-P002972) Avail: NTIS HC A99/MF A01 CSCL 21/2

Near-equidiffusional flames (NEFs) are characterized by near-unity Lewis numbers, near-adiabatic flame temperatures and near-uniform enthalpies. These flames are special three-dimensional solutions of the combustion equations and provide a convenient framework for the theoretical study of a number of flame phenomena. An extensive discussion of NEFs appears in Chapters 2 and 8 of Buckmaster and Ludford (1982), where a set of reduced equations governing these flames has also been derived. This paper is concerned with a study of the linearized stability problem associated with the plane NEFs. GRA

N84-24209# Cornell Univ., Ithaca, N.Y.
WRINKLED-FLAME CALCULATIONS REVISITED **c25**
H. V. McConnaughey and G. S. S. Ludford *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 791-800 (For primary document see N84-24173 14-59)
(Contracts DAAG29-80-C-0041; DAAG29-81-K-0127; Grant NSF MCS-79-27062)
(AD-P002973) Avail: NTIS HC A99/MF A01 CSCL 21/2

The numerical integration of a nonlinear singular integral equation governing wrinkled plane flames is reconsidered, and the discussion extended to its counterpart for freely expanding cylindrical flames. Straight forward discretization is shown to give unsatisfactory results and a suggestion is made of how to avoid these by subtracting out the principal part of the solution near its singularity. Author (GRA)

N84-24210# Illinois Univ., Urbana. Dept. of Theoretical and Applied Mechanics.
NEAR CHAPMAN-JOUGET DETONATIONS **c34**
D. S. Stewart and G. S. S. Ludford *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 801-811 (For primary document see N84-24173 14-59)
(AD-P002974) Avail: NTIS HC A99/MF A01 CSCL 19/4

The moving boundary problem that arises from a certain model of one-dimensional detonation waves is considered. Burgers equations for a function, f, have to be solved on the two sides of a discontinuity, at which f and the jump in its derivative (corresponding to the exothermic reaction) are prescribed. The steady solution, a summary of its linear stability characteristics, and some preliminary numerical results are presented. Author (GRA)

N84-24211# Cornell Univ., Ithaca, N.Y. Dept. of Theoretical and Applied Mechanics.
ARE DETONATIONS STEADY? **c34**
A. A. Oyediran and G. S. S. Ludford *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 813-816 (For primary document see N84-24173 14-59)
(AD-P002975) Avail: NTIS HC A99/MF A01 CSCL 19/4

A generic problem in the transition from deflagration to detonation is the overtaking of a steady deflagration wave by a steady shock wave. Such a collision produces a detonation wave (as well as a contact discontinuity, a back shock, and sometimes a rarefaction wave). Work reported at the 27th Conference of Army Mathematicians showed that, for small heat release in the deflagration, the detonation wave cannot be steady. Here we remove the restriction to small heat release and show that the detonation wave can never be steady. Author (GRA)

N84-24212# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.

THERMAL AND TRANSFORMATION STRESSES IN HOLLOW TUBES DURING THE QUENCHING PROCESS **c39**
J. D. Vasilakis *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 817-849 (For primary document see N84-24173 14-59)
(AD-P002976) Avail: NTIS HC A99/MF A01 CSCL 11/6

During the heat treatment of components, the transient thermal stresses can be very high. This is especially true if a severe quench is required such as the quenching of steel gun tubes for the development of a martensitic grain structure. In addition to the large transient thermal stresses, severe transformation stresses also exist due to the structural volume change involved. If these stresses are high enough, inelastic response of the material must be considered and residual stresses will exist in the structure when the process is complete. In this paper, both thermal and transformation stresses are computed for various quenching procedures using a hollow tube for the geometric model. The relative severity of the thermal and transformation stresses and the conditions under which they occur are discussed. A general purpose finite element code, ADINA, is used for the computation. Author (GRA)

N84-24213# Army Materials and Mechanics Research Center, Watertown, Mass.
FINITE ELEMENT ANALYSIS OF FABRICS WITH NONLINEAR STRESS-STRAIN LAWS **c39**
A. R. Johnson *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 851-870 (For primary document see N84-24173 14-59)
(AD-P002977) Avail: NTIS HC A99/MF A01 CSCL 11/5

The material constitutive relationships for woven fabrics are nonlinear. This, together with the fact that transversely loaded fabric membranes undergo large deformations, presents a difficult analysis problem to designers using fabrics in structures. In this effort, the constant strain triangular element' is used for the development of finite element gradient and tangent matrices for the case when the material energy density functional is a Constant squared function of the warp and fill strains. The element matrices are derived using the nonlinear Green strain-displacement relations to describe the warp and fill strains in terms of the deformations of the fabric. Biaxial stress-strain data for a 2.6 oz/sq of cotton cloth is used to obtain approximate stress-strain functionals and an energy density functional. The element is used to determine the deformations and stresses in a uniformly loaded square fabric membrane. Author (GRA)

N84-24214# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
EXPLICIT FORMULAS FOR C TO THE nTH POWER PIECEWISE HERMITE BASIS FUNCTIONS **c67**
R. W. Soanes, Jr. *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 871-876 (For primary document see N84-24173 14-59)
(AD-P002978) Avail: NTIS HC A99/MF A01 CSCL 12/1

Completely factored forms of the piecewise Hermite basis functions are derived. All necessary coefficients for any level of smoothness are shown to reside conveniently in Pascal's triangle. GRA

N84-24215# Texas A&M Univ., College Station.
BIVARIATE QUADRATIC SPLINES ON CRISSCROSS TRIANGULATIONS **c64**
C. K. Chui *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 877-882 (For primary document see N84-24173 14-59)
(AD-P002979) Avail: NTIS HC A99/MF A01 CSCL 12/1

A bivariate C superscript 1 quadratic B-spline basis for the space of C superscript 1 piecewise polynomials with total degree two on a crisscross triangulation is given. This basis has very important algebraic, geometric and approximatic properties, and can be used in a variety of applications. In particular, it can be used adaptively in pattern recognition, image processing and data reduction. In image restoration, for example, it gives much better pictures than the tensor product splines using the same discrete data. Author (GRA)

N84-24216*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPECTRAL METHODS FOR PARTIAL DIFFERENTIAL EQUATIONS **c64**
M. Y. Hussaini, C. L. Streett, and T. A. Zang *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 883-925 (For primary document see N84-24173 14-59)
(AD-P002980) Avail: NTIS HC A99/MF A01 CSCL 12A

Origins of spectral methods, especially their relation to the Method of Weighted Residuals, are surveyed. Basic Fourier, Chebyshev, and Legendre spectral concepts are reviewed, and demonstrated through application to simple model problems. Both collocation and tau methods are considered. These techniques are then applied to a number of difficult, nonlinear problems of hyperbolic, parabolic, elliptic, and mixed type. Fluid-dynamical applications are emphasized. GRA

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N84-24217# Naval Postgraduate School, Monterey, Calif.
A METHODOLOGY FOR BENCHMARKING RELATIONAL DATABASE MACHINES
P. R. Strawser Jan. 1984 235 p
(RR0-1408)
(AD-A139104; NPS52-84-004) Avail: NTIS HC A11/MF A01 CSCL 09/2

The thesis presents a methodology for benchmarking relational database machines. It provides a standard for benchmarking relational database machines and relational software database management systems. As a methodology, a collection of methods, tools, and procedures is included. The methodology is based on a three-level hierarchy of models. At the lowest level is the machine model. The machine is modeled as a high-level language architecture, i.e., as a machine which executes a relational query language. This approach gives a degree of machine-independence. The next level in the hierarchy is the database model. The database is modeled as a synthetic database consisting of twelve relations of varying tuple width and cardinality. The relations are based on a standard tuple template. This approach gives us database independence, i.e., the database model is independent of any real-world database. The highest level in the hierarchy is the applications model. We present two applications models. GRA

N84-24218# Colorado Univ., Boulder.
EFFICIENT REALIZATIONS IN HARDWARE IMPLEMENTATIONS FOR DIGITAL SIGNAL PROCESSING Final Report, 26 Aug. 1980 - 30 Nov. 1983
R. A. Roberts 1 Mar. 1984 5 p
(Contract DAAG29-80-K-0062)
(AD-A139112; ARO-17538.5-EL) Avail: NTIS HC A02/MF A01 CSCL 09/3

Digital signal processing is an ever increasingly important application of theoretical principles needed to process numerical information by digital means. DSP has recently been impacted by the technology of microelectronics (VLSI). VLSI has changed certain previously held concepts on the complexity of algorithms and implementations. This research has been directed at understanding the important parameters in VLSI as applied to digital signal processing problems. Author (GRA)

N84-24219# California Univ., San Diego, La Jolla. Dept. of Mathematics.

DESIGNING EFFICIENT COMMUNICATION NETWORKS Final Report, Oct. 1982 - Sep. 1983
G. Carlsson Dec. 1983 42 p
(Contract N66001-83-C-0382)
(AD-A139190; Rept-84-030; NOSC-CR-210) Avail: NTIS HC A03/MF A01 CSCL 09/2

In recent years it has become clear that communication time between processors is one of the most severe limiting factors in designing high speed parallel computers. Further, for massively parallel machines unrestricted communication via such methods as data buses is impractical. Thus, it seems sensible to investigate the design of networks which allow efficient communication between processors subject to the restriction that each processing element may 'talk' to a fixed small number equal to or less than 10, say) of others. This report examines this problem in both a purely heuristic way, and also investigates a theoretical method of attack. Author (GRA)

N84-24220# Maryland Univ., College Park. Dept. of Computer Science.
FORMAL SPECIFICATION AND VERIFICATION OF DISTRIBUTED SYSTEM
B. S. Chen and R. T. Yeh Jun. 1983 49 p
(Contract F49620-80-C-0001; AF Proj. 2304)
(AD-A139305; TR-1295; AFOSR-84-0172TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

Computations of distributed systems are extremely difficult to specify and verify using traditional techniques because the systems are inherently concurrent, asynchronous, and nondeterministic. Furthermore, computing nodes in a distributed system may be highly independent of each other, and the entire system may lack an accurate global clock. In this thesis, we develop an event-based model to specify formally the behavior (the external view) and the structure (the internal view) of distributed systems. Both control-related and data-related properties of distributed systems are specified using two fundamental relationships among events: the precedes relation, representing time order; and the enables relations, representing causality. No assumption about the existence of a global clock is made in the specifications. GRA

N84-24221# General Accounting Office, Washington, D. C. Information Management and Technology Div.
AIR FORCE PROGRESS IN IMPLEMENTING THE PHASE 4 BASE LEVEL COMPUTER REPLACEMENT PROGRAM
18 Jan. 1984 17 p
(AD-A139378; GAO/IMTEC-84-7) Avail: NTIS HC A02/MF A01 CSCL 09/2

The Air Force had designed a program, called Phase IV, to replace computers at 118 air bases around the world by July 1985. Because of difficulties in converting the old software to run on the new computers and in demonstrating that the new computers can meet the bases' expected workload, the Air Force is 6 months behind schedule in implementing Phase IV at its first site. According to the Air Force, this delay will increase overall costs by about $6 million. However, the Air Force expects to recover from the delay by March 1985. Although every effort should be made to stay on schedule and to avoid increased costs, GAO believes that overall quality should not be compromised. The converted software and computers must be thoroughly tested before being implemented at other bases. According to the Air Force, a 1980 redirection of Phase IV has produced significant savings. The Air Force estimates that, as a result of Phase IV and refinements made incident to the Phase IV redirection, total acquisition and operation savings over the next 20 years will be $1.8 billion. By following through with commitments made to the House Committee on Government Operations in 1980, the Air Force can realize additional savings. The Assistant Secretary of the Air Force (Financial Management) is acting on issues raised in this report. Author (GRA)

N84-24222# Naval Ocean Systems Center, San Diego, Calif.
MICROPROCESSOR DATABASE MANAGEMENT SYSTEMS (DBMS): EVALUATION AND COMPARISON OF THREE COMMERCIAL DBMS Final Report, Jul. 1982 - Sep. 1983
S. S. Duchene Dec. 1983 35 p
(AD-A139560; NOSC/TR-937) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report compares the relevant characteristics of three selected DataBase Management System (DBMS) software packages hosted on a microcomputer running the Control Program for Microcomputers(CP/M) Operating System. The candidate commercial DBMS programs (dBASE II, Condor Series 20, and FMS-80), each available at a cost of $1,000 or less, were identified and evaluated. They were compared on the basis of being simple to use and able to completely satisfy the requirements of the specified application areas of report automation, personnel record management, bibliography modification and printing, and document inventory. After intensive testing and evaluation, dBASE II was determined to be the most appropriate choice for the applications tested. Author (GRA)

N84-24223# Computer Corp. of America, Cambridge, Mass.
DISTRIBUTED DATABASE CONTROL AND ALLOCATION. VOLUME 1: FRAMEWORKS FOR UNDERSTANDING CONCURRENCY CONTROL AND RECOVERY ALGORITHMS Final Technical Report, Jan. 1981 - Jan. 1983
W. K. Lin, P. A. Bernstein, N. Goodman, and J. Nolte Griffiss AFB, N.Y. RADC Oct. 1983 300 p 3 Vol.
(Contract F30602-81-C-0028; AF Proj. 5581)
(AD-A138891; RADC-TR-83-226-Vol-1) Avail: NTIS HC A13/MF A01 CSCL 09/2

This is the first of the three volumes of the final technical report for the project Distributed Database Control and Allocation. This volume describes frameworks for understanding concurrency control and recovery algorithms for centralized and distributed database systems. GRA

N84-24224# Computer Corp. of America, Cambridge, Mass.
DISTRIBUTED DATABASE CONTROL AND ALLOCATION. VOLUME 2: PERFORMANCE ANALYSIS OF CONCURRENCY CONTROL ALGORITHMS Final Technical Report, Jan. 1981 - Jan. 1983
W. K. Lin, P. A. Bernstein, N. Goodman, and J. Nolte Griffiss AFB, N.Y. RADC Oct. 1983 125 p 3 Vol.
(Contract F30602-81-C-0028; AF Proj. 5581)
(AD-A138892; RADC-TR-83-226-Vol-2) Avail: NTIS HC A06/MF A01 CSCL 09/2

This is the second of three volumes of the final technical report for the project Distributed Database Control and Allocation. This volume describes work on the performance analysis of concurrency control algorithms. GRA

N84-24225# Computer Corp. of America, Cambridge, Mass.
DISTRIBUTED DATABASE CONTROL AND ALLOCATION. VOLUME 3: DISTRIBUTED DATABASE SYSTEM DESIGNER'S HANDBOOK Final Technical Report, Jan. 1981 - Jan. 1983
W. K. Lin, P. A. Bernstein, N. Goodman, and J. Nolte Griffiss AFB, N.Y. RADC Oct. 1983 93 p 3 Vol.
(Contract F30602-81-C-0028; AF Proj. 5581)
(AD-A138893; RADC-TR-83-226-Vol-3) Avail: NTIS HC A05/MF A01 CSCL 09/2

This is the third of three volumes of the final technical report for the project Distributed Database Control and Allocation. This volume attempts to provide a handbook of information about a number of important concurrency control algorithms which can be used in the design of a distributed data base management system. GRA

N84-24226# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Information und Dokumentation.
MINIATURIZED MEASUREMENT AND TESTING (MMT) SYSTEM [MMP-MINIATURISIERTES MESS- UND PRUEFSYSTEM]
S. Scheer 8 Mar. 1983 19 p In GERMAN; ENGLISH summary Presented at ATE Conf., Wiesbaden, 8 Mar. 1983
(MBB-UA-767-83-O) Avail: NTIS HC A02/MF A01

The universal application MMT, an easily configurable micro-

processor system for data acquisition, processing, and output is presented. It is used for measurement and testing in real time environments. The construction of the individual system components and modules in hardware and software is described. The techniques used and the miniaturization of complex modules are emphasized. The method to achieve a standardized multi-application test system is explained. Author (ESA)

N84-24227# National Bureau of Standards, Washington, D.C. Inst. for Computer Sciences and Technology.
BIBLIOGRAPHY OF THE LITERATURE ON OPTICAL STORAGE TECHNOLOGY Final Report
James R. Park Dec. 1983 182 p
(PB84-150184; NBS-SP-500-107; LC-83-600617) Avail: NTIS HC A09/MF A01 CSCL 09B

A bibliography containing nearly 700 references related to optical storage and retrieval of digital computer data is given. The citation are divided into two major groupings: General Literature and Patent Literature Documents. Annotations are provided under the General Literature for many of the references in the critical area concerned with the media used for the optical recording and playback of optical digital data disks. The documents were classified into several broad categories for the user's convenience. Access to the individual citations for each category is obtained through cross indexes which facilitate the rapid selection of pertinent articles. In addition to the categorical classifications, several other indexes are included. GRA

N84-24228# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
WORKSHOP ON MULTIPROCESSORS FOR HIGH PERFORMANCE PARALLEL COMPUTATION: POSITION PAPERS
1983 127 p refs Workshop held at Seven Springs, Pa., 27-29 Jun. 1983
(Grant NSF ECS-82-15465)
(PB84-152545; NSF/ECS-83020) Avail: NTIS HC A07/MF A01 CSCL 09B

The design, development, and use of multiprocessors for applications that require high performance computation are presented are discussed. Such topics as parallel problem solving and architecture, the relation of a parallel program to its attributes, testbed concepts for parallel computation, circuit and packet switch interconnection networks, experiments with ensemble architectures, matching algorithms and architectures, and a rational approach to monitoring microprocessors are discussed. New parallel algorithms for large problems are considered and alternative implementations of a single parallel algorithm are examined. Workshop participants are listed. GRA

N84-24229# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
WORKSHOP ON MULTIPROCESSORS FOR HIGH PERFORMANCE PARALLEL COMPUTATION
A. K. Jones, Z. Segall, C. Seitz, and A. Wilson 1983 36 p refs Workshop held at Seven Springs, Pa., 27-29 Jun. 1983
(Grant NSF ECS-82-15465)
(PB84-152677; CMU-CS-83-164; NSF/ECS-83019) Avail: NTIS HC A03/MF A01 CSCL 09B

A workshop that was held to assess the status of research in multiprocessor systems that provide high performance, parallel computation is summarized. The following issues are addressed: What are the most important experiments to perform in the existing multiprocessor laboratories, and how can the experimenters best communicate the results; How can newly proposed software/hardware architectures and the corresponding parallel algorithms be evaluated; and, What are the trade offs in specializing parallel machines to important classes of large-scale applications. It is recommended that a national experimental multiprocessor laboratory be developed that is conductive to experimentation with new architectural concepts, equipped with support for parallel models and languages, and easily accessible to multiple research communities. It is suggested that both the amount of effort and the time required to suitable design, construct, and evaluate prototype systems be reduced. GRA

N84-23803# Joint Publications Research Service, Arlington, Va.
NEW DEVELOPMENTS IN SCIENCE, AND TECHNOLOGY DESCRIBED. SPECIALIZED GEO-20 MINICOMPUTER SYSTEM Abstract Only
In its East Europe Rept.: Sci. Affairs (JPRS-ESA-84-009) 21 Mar. 1984 p 17 Transl. into ENGLISH from Polish Eng. (Warsaw), no. 3, Mar. 1984 p 4 (For primary document see N84-23802 14-31)
Avail: NTIS HC A03/MF A01

N84-23823# TRW, Inc., Colorado Springs, Colo.
DISTRIBUTED DATABASE PERFORMANCE MODELING
M. Tsuchiya and M. P. Mariani *In* AF Academy Proc. of the 1983 Symp. on Mil. Space Commun. and Operations 1983 p 103-107 refs (For primary document see N84-23809 14-32)
(AD-P002157) Avail: NTIS HC A07/MF A01 CSCL 09/2

N84-24139# Himeji Inst. of Tech. (Japan). Dept. of Electronics.
SYNTHESIS METHOD FOR TERNARY LOGIC FUNCTION BASED ON NAND-TYPE POLYPHECK
M. Yanagita, N. Fukuda, Y. Miyoshi, K. Nakashima, and K. Yamoto *In* Northwestern Univ. The 13th Intern Symp. on Multiple-Valued Logic 1983 p 172-176 refs (For primary document see N84-24115 14-59)
(AD-P002348) Avail: NTIS HC A19/MF A01 CSCL 09/2

N84-24152# Maryland Univ., College Park. Dept. of Electrical Engineering.
SOME DEVICE COUNT COMPARISONS FOR REDUCED CONTROL STORES USING MOS (METAL-OXIDE SEMICONDUCTOR) CIRCUITS
C. B. Silio, Jr. and J. H. Pugsley *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 249-254 refs (For primary document see N84-24115 14-59)
(AD-P002361) Avail: NTIS HC A19/MF A01 CSCL 09/2

N84-24165# Northwestern Univ., Evanston, Ill. Dept. of Electrical Engineering and Computer Science.
RELATIONS AMONG SYSTEM DIAGNOSIS MODELS WITH 3-VALUED TEST OUTCOMES
Jon T. Butler *In its* The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 350-355 refs (For primary document see N84-24115 14-59)
(Grant NSF ECS-82-03276)
(AD-P002374) Avail: NTIS HC A19/MF A01 CSCL 09/2

N84-24171# Bristol Univ. (England). Dept. of Engineering Mathematics.
A FUZZY RELATIONAL INFERENCE LANGUAGE FOR EXPERT SYSTEMS
J. F. Baldwin *In* Northwester Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 416-421 refs (For primary document see N84-24115 14-59)
(AD-P002380) Avail: NTIS HC A19/MF A01 CSCL 09/2

N84-24444# Bell Telephone Labs., Inc., Holmdel, N. J.
CONSIDERATIONS INVOLVED IN THE DESIGN OF AN OPTICAL DIGITAL COMPUTER Abstract Only
Alan Huang *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 09/2

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N84-24230*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

ERB MASTER ARCHIVAL TAPE SPECIFICATION NO. T 134081 ERB MAT, REVISION 1
May 1984 61 p refs
(NASA-TM-85612; NAS 1.15:85612) Avail: NTIS HC A04/MF A01 CSCL 09B

The Earth radiation budget (ERB)MAT tapes are generated by the ERB MATGEN software using the IBM 3081 computer system operated by the Science and Applications Computer Center at Goddard Space Flight Center. All MAT's are 9-track and MAT data are in ascending time order. The gross tape format for NIMBUS year-1 and year-2 MAT's is different from the format of MAT's starting with year-3. The MATs from the first two years are to contain one day's worth of data while all other MATs are to contain multiple day's worth of data stacked onto the tapes. Author

N84-24231# Naval Postgraduate School, Monterey, Calif.
COMPUTER PROGRAMS FOR HELICOPTER DATA DISPLAY AND CONCEPTUAL DESIGN M.S. Thesis
G. M. Bishop Dec. 1983 171 p
(AD-A139096) Avail: NTIS HC A08/MF A01 CSCL 09/2

This thesis allows a person with access to a computer that uses the FORTRAN language and that is equipped with the DISSPLA software system the ability to select and graphically portray for analysis the critical design parameters of actual helicopters. It also allows a person with access to any computer that uses the FORTRAN language the ability to do a complete conceptual design of a helicopter at one sitting in accordance with the procedures in the Helicopter Design Manual published as course notes for Helicopter Design course at the Naval Postgraduate School. Author (GRA)

N84-24232# Naval Postgraduate School, Monterey, Calif.
DEVELOPMENT OF A MICROCOMPUTER-BASED ENGINEERING DESIGN OPTIMIZATION SOFTWARE PACKAGE M.S. Thesis
R. L. Booth Dec. 1983 101 p
(AD-A139123) Avail: NTIS HC A06/MF A01 CSCL 09/2

A general purpose software package was developed perform nonlinear constrained optimization of user-defined engineering design problems of significant complexity using desktop computers. The package, designated Microcomputer-based Design Optimization Tool (MDOT), will accept nonlinear functions of up to ten variables, which may be bounded, with as many as fifty constraints. It was implemented on a Hewlett-Packard Model 85 microcomputer with 32 Kbytes of random access memory. MDOT employs the method of feasible directions for constrained functions. It is interactive, provides for monitoring the optimization progress, and can be interrupted to restart from a new point in the design space. Typical applications of MDOT are in the design of machine components composite laminates, and piping systems.
Author (GRA)

N84-24233# Syracuse Univ., N. Y.
A GUIDEBOOK FOR SOFTWARE RELIABILITY ASSESSMENT Final Technical Report, Jan. 1982 - Apr. 1983
A. L. Goel Aug. 1983 14229 p
(Contract F30602-81-C-0169; AF Proj. 5581)
(AD-A139240; RADC-TR-83-176) Avail: NTIS HC A11/MF A01 CSCL 09/2

The purpose of this guidebook is to provide state-of-the-art information about the selection and use of existing software reliability models. Towards this objective, we have presented a brief summary of the available models backed by a detailed discussion of most of the models in the appendices. One of the difficulties in choosing a model is to find a match between the testing environment and a class of models. To help a user in this process, we have presented a detailed discussion of most of the assumptions that characterize the various software reliability models. The process of developing a model has been explained in detail and illustrated via numerical examples. Author (GRA)

N84-24234# Maryland Univ., College Park. Center for Automation Research.
ON MAPPING CUBE GRAPHS ON VLSI ARRAY AND TREE ARCHITECTURES
I. V. Ramakrishnan and P. J. Varman (Rice Univ.) Dec. 1983 34 p
(Contract F49620-83-C-0082; AF Proj. 2304)
(AD-A139306; CAR-TR-40; CS-TR-1358; AFOSR-84-0173TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

We formalize a model of array architectures suitable for VLSI implementation. A formal model of an arbitrarily structured tree machine is also presented. A mathematical framework is developed to transform cube graphs, which are data-flow descriptions of certain matrix computations, onto the array and tree models. All published algorithms for these computations can be obtained using the mathematical framework. In addition, novel linear-array algorithms for matrix multiplication are obtained. More importantly, the algorithms obtained for the tree model are of special significance. Besides their novelty, the independence of the tree algorithms from a specific inter-processor communication geometry make them robust to hardware faults as opposed to algorithms that are based on specific interconnection requirements.
Author (GRA)

N84-24235# Wisconsin Univ., Madison. Mathematics Research Center.
AN INTRODUCTION TO THE SCIENTIFIC COMPUTING LANGUAGE PASCAL-SC (PASCAL FOR SCIENTIFIC COMPUTATION) Technical Summary Report
L. B. Rall Feb. 1984 49 p
(Contract DAAG29-80-C-0041)
(AD-A139316; MRC-TSR-2644) Avail: NTIS HC A03/MF A01 CSCL 09/2

Pascal-SC (Pascal for Scientific Computation) is an extension of the popular computer language Pascal. Pascal-SC greatly facilitates scientific, engineering, and statistical calculations on microcomputers. The most important of the additional capabilities of Pascal-SC are accurate floating-point arithmetic for real, complex, and interval numbers, vectors, and matrices and user-defined operators to allow the manipulation of data of various nonstandard types by expressions written in essentially ordinary mathematical notation, instead of the sequences of calls to functions and procedures required in ordinary Pascal. Brief descriptions of these useful features of Pascal-SC are given, together with illustrative examples. Some familiarity with ordinary Pascal is assumed. GRA

N84-24236# State Univ. of New York at Buffalo, Amherst. Dept. of Industrial Engineering.
COMPUTER AIDED LAYOUT OF PROCEDURE INFORMATION FOR TRAINING AND JOB AIDING Technical Note
C. Sylla and A. J. G. Babu Dec. 1983 264 p
(Contract N61339-81-C-0091)
(AD-A139347; TAEG-TN-11-83) Avail: NTIS HC A12/MF A01 CSCL 05/9

Operation and maintenance tasks for modern military systems often include long and complex procedures. These procedures must be learned and then performed from memory with the help of simple checklists or comprehensive job performance aids. Text-graphic pages have proven to be effective in supporting a technician in learning procedures and also as aids in performing procedures. This report describes an effort to reduce the cost of producing text-graphic papers through the use of computer routines. The main concern is automating the layout process. A model was developed to optimally decompose a procedure into elements, to logically divide the elements into sets that can be displayed on individual pages, and to automatically format the rectangular objects into pages. A heuristic was developed to handle dividing the procedure into pages and the page formatting process. The arrangement and layout problem of a single page is formulated mathematically, and a heuristic procedure based on a pairwise exchange method was developed and used to solve this problem. The overall solution integrates these heuristics so as to mimic an intelligent human designer for the splitting of complex procedures into page sized segments and the formatting of these pages. GRA

N84-24237# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

THE EXTENDED MULTI-ATTRIBUTE DECISION ANALYSIS MODEL (EMADAM)

A. R. DeWispelare Aug. 1983 73 p

(AD-A139510; AU-AFIT-EN-TR-83-3) Avail: NTIS HC A04/MF A01 CSCL 09/2

This research is an on-going effort to produce an interactive, computer-based aid suitable for use in decision situations and long-term planning. The current research involves the development of extensions to the applicability of a decision aid embodied in the computer program MADAM: Multi-Attribute Decision Analysis Model. The theoretical underpinnings of MADAM involve portions of multi-attribute utility theory. This interactive program is designed to aid the decision-maker in all phases of decision analysis from problem formulation to sensitivity analysis. The program is a tool designed to be used by a decision-maker in order to facilitate making rational and consistent trade-offs and subdecisions throughout the entire decision-making process. The stages of the decision analysis covered by the program include formation of an objectives hierarchy, elicitation of an appropriate set of attributes, examining the relationship between the attributes, establishing criterion weights, evaluating candidate solutions, and performing several types of sensitivity analysis. GRA

N84-24238# Naval Ship Research and Development Center, Bethesda, Md.

INTERACTIVE SIGNAL SYNTHESIS SYSTEM USER'S GUIDE Final Report

I. S. Zaritsky Mar. 1984 57 p

(SR0-1403)

(AD-A139594; DTNSRDC-84/011) Avail: NTIS HC A04/MF A01 CSCL 09/2

The Interactive Signal Synthesis System is a user-oriented FORTRAN program designed to give the signal analyst the ability to generate controlled time series of arbitrary length and complexity. With the system, one can parameterize basic signal functions such as tone, gate, noise, polynomial, and arbitrary data, and also parameterize the shifted sum, damping, modulation, and filtering of each function. The decisions required of a user, when creating a function, are described. Author (GRA)

N84-24239# California Univ., Livermore. Lawrence Livermore Lab.

OMEGA DOCUMENTATION

R. J. Hoverton, R. E. Dye, P. C. Giles, J. R. Kimlinger, and S. T. Perkins Aug. 1983 145 p refs

(DE84-007014; UCRL-50400-Vol-25) Avail: NTIS HC A07/MF A01

OMEGA is a CRAY I computer program that controls none codes used by LLNL Physical Data Group for: (1) updating the libraries of evaluated data maintained by the group (UPDATE); (2) calculating average values of energy deposited in secondary particles and residual nuclei (ENDEP); (3) checking the libraries for internal consistency, especially for enegy conservation (GAMCHK); (4) producing listings, indexes, and plots of the library data (UTILITY); (5) producing calculational constants such as group averaged cross sections and transfer matrices for diffusion and Sn transport codes (CLYDE); (6) producing and updating standard files of the calculational constants used by LLNL Sn and diffusion transport codes (NDFL); (7) producing calculational constants for Monte Carlo transport codes that the use group averaged cross sections and continuous energy for particles (CTART); (8) producing and updating standard files used by the LLNL Monte Carlo transport codes (TRTL); and (9) producing standard files used by the LANL pointwise Monte Carlo transport code MCNP (MCPOINT). The first four of these functions and codes deal with the libraries of evaluated data and the last five deal with various aspects of producing calculational constants for use by transport codes. In 1970, a series of internal and informal memoranda called PD memos was begun. Those memoranda served as source material for this more comprehensive report. DOE

N84-24240# Office of Software Development, Falls Church, Va. Federal Software Testing Center.

SPERRY UNIVAC, OS/3 BASIC VERSION 9.0 Validation Summary Report

29 Aug. 1983 33 p refs

(PB84-150218; OSD/FSTC-83/170) Avail: NTIS HC A03/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Sperry Univac, OS/3 BASIC Version 9.0 running under the OS/3 Level 8.0 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 BASIC Standard (X3.60-1978/FIPS PUB 68). The compiler was validated against the Minimal BASIC level of FIPS PUB 68. The VSR is made up of several sections howing all the discrepancies found-if any. These include an overview of the validation which lists all categories of dsicrepancies within X3.60-1978 and a detailed listing of discrepancies together with the tests which failed. GRA

N84-24241# Office of Software Development, Falls Church, Va. Federal Software Testing Center.

DATA GENERAL CORPORATION, ECLIPSE MV/8000, AOS/VS HICOBOL, REVISION 2.01

22 Dec. 1983 64 p refs

(PB84-157346; OIT/FSTC-83/2.01-Rev-2.01) Avail: NTIS HC A04/MF A01 CSCL 09B

A Validation Summary Report (VSR) for the Data General Corporation, AOS/VS HICOBOL Revision 2.01 running under the AOS/VS Revision 3.06 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the High-Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N84-24242# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.

SOFTWARE IMPROVEMENT PROCESS: ITS PHASES AND TASKS. PART 1: TEXT. PART 2: APPENDICES Final Report

Jul. 1983 338 p refs

(PB84-162460; OSD/FCTC-83/006) Avail: NTIS HC A15/MF A01 CSCL 09B

ADP organizations are plagued with high maintenance costs, long delays in respondin to users' changing needs, and continued development and maintenance of antiquated, outmoded, and relatively obsolete software. This software can be thought of as being in an advanced state of software senility, a degenerative condition, which if not corrected, will eventually render the software totally useless. A reversal of this situation requires a Software Improvement Program (SIP), which is a treatment for the ills of software senility, and offers a cure for many of the software problems from which most ADP organizations are suffering. A SIP is an incremental and evolutionary approach to modernizing software to maximize its value, quality, efficiency, and effectiveness, while simultaneously preserving the value of past software investments and enabling the organization to capitalize on today's modern ADP technology, as well as future technological advances in the field. The SIP philosophy and a strategy for implementing a dynamic, ongoing SIP coupled with a sound Softare Engineering Technology (SET), to attack the causative factors of the ever-growing software crisis are described. GRA

N84-24243# National Bureau of Standards, Washington, D.C. Center for Programming Science and Technology.

COMPUTER SCIENCE AND TECHNOLOGY: GUIDE ON DATA MODELS IN THE SELECTION AND USE OF DATABASE MANAGEMENT SYSTEMS Final Report

Leonard J. Gallagher and Jesse M. Draper Jan. 1984 74 p refs

(PB84-162189; NBS-SP-500-108; LC-83-600630) Avail: NTIS

HC A04/MF A01 CSCL 09B

Selecting a database management system involves matching users' requirements and the capabilities of available products. One way to simplify thus task is to define data models identifying both data structures and the operations on those structures. In the past every commercial product has implemented its own data model. Now technical committee X3H2 of the American National Standards Institute is working on specifications for two models that are similar but not identical to many existing products. In addition to the issue of data models, prospective buyers of database software need to consider features that affect daily operations. Existing hardware and operating systems sometimes limit the choice to a new commerical products. Systems also vary widely in their facilities for backup and recovery, bulk loading, scheme manipulation, concurrency control, and report writers.

Author (GRA)

N84-24244# Ultracom, Inc., Del Mar, Calif.

DEVELOPMENT OF A PROPOSED STANDARD FOR THE EXCHANGE OF SCIENTIFIC MICROCOMPUTER PROGRAMS Summary Report

John M. Fiscella Nov. 1983 16 p

(PB84-157940; ULT-2002) Avail: NTIS HC A02/MF A01 CSCL 09B

The incompatibility problems encountered between different microcomputer and supermicrocomputer systems for the exchange of software are reviewed. It examines the causes of exchange incompatibility for some of the most widely used hardware and operating systems, with the aim of specifing a set of exchange standards. More than one standards set is required because of the diversity of operating systems and mass storage formats. The exchange standard developed include specifications of what types of files are to be included on the mass storage exchange medium, as well as a full description of the mass storage format (including medium, density, operating system, etc.). Three different exchange standard sets are recommended, all utilizing diskettes. Author

N84-24245# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development

UNITED INFORMATION SERVICES, INC., CDC CYBER 175, CDC FORTRAN 5.1 Validation Summary Report

2 Nov. 1983 15 p

(PB84-157668; OSD/FSTC-83/282) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the United Information Services, Inc., CDC FORTRAN 5.1 Level 577 running under the APEX DELTA 4.7.3 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Full Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N84-24246# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.

TANDEM COMPUTERS, INCORPORATED, TANDEM NONSTOP 2, FORTRAN T92002E01 Validation Summary Report

2 Oct. 1983 16 p

(PB84-157569; OSD/FSTC-82/336) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Tandem Computers Inc., FORTRAN T9202E01 running under the GUARDIAN T9050A05 provides a consolidated summary of the resuls obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Full Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N84-24247# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.

HONEYWELL INFORMATION SYSTEMS, DPS 8/49, (8)BA2.3 BASIC COMPILER Validation Summary Report

21 Oct. 1983 10 p

(PB84-157296; OSD/FSTC-83/274) Avail: NTIS HC A02/MF A01 CSCL 09B

A Validation Summary Report (VSR) for the Honeywell Information Systems (8) BA2.3 BASIC Compiler running under the GCOS 8 SR2300 provides a consolidated summary of the resits obtained from the validation of the subject compiler against the 1978 BASIC Standard (X3,60-1978/FIPS PUB 68). The compiler was validated against the Minimal BASIC level of FIPS PUB 68. All the discrepancies found - if any are shown. These include an overview of the validation which lists all categories of discrepancies within X3.60-1978 and a detailed listing of discrepancies together with the tests which failed. GRA

N84-24248# Office of Software Development, Falls Church, Va. Federal Software Testing Center.

INTEL CORPORATION INTEL SYSTEM 86/330A, FORTRAN 86 RELEASE 2.1 Validation Summary Report

27 Sep. 1983 18 p refs

(PB84-155134; OSD/FCTC-83/255) Avail: NTIS HC A02/MF A01 CSCL 09B

Validation Summary Report (VSR) for the intel Corporation, FORTRAN 86, Release 2.1 running under the IRMX 86 Release 5 provides a consolidated summary of the results obtained from the validation of the subject complier against the 1978 FORTRAN Standard against the Subset Level FORTRAN level of FIPS PUB 69. All the discrepancies found - if any are given. These include an overview of the validation which lists all categories of discrepancies within X3.9-1976, and a detailed listing of discrepancies together with the tests which failed. GRA

N84-24249# Office of Software Development, Falls Church, Va. Federal Software Testing Center.

PRIME COMPUTER, INCORPORATED, PRIME 750, COBOL-74 19.4, REVISED Validation Summary Report

31 Dec. 1983 56 p refs

(PB84-155985; OSD/FSTC-83/310-Rev) Avail: NTIS HC A04/MF A01 CSCL 09B

Validation Summary Report (VSR) for the Prime Computer, Inc., COBOL-74 Revision 19.4 (Pre-rel.) running under the PRIMOS Revision 19.2.3 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the Low-Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N84-24250# Office of Software Development, Falls Church, Va. Federal Software Testing Center.

DATA GENERAL CORPORATION, ECLIPSE MV/8000, AOS FORTRAN 77 2.21, REVISED Validation Summary Report

22 Dec. 1983 16 p refs

(PB84-156124; OIT/FSTC-83/302-Rev) Avail: NTIS HC A02/MF A01 CSCL 09B

A Validation Summary Report (VSR) for the Data General Corporation, AOS FORTRAN 77 Revision 2.21 running under the AOS/VS Revision 3.06 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Full Level FORTRAN level of FIPS PUB 69. All the discrepancies found, if any, are given. These

include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N84-24251# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
COBOL TECHNICAL REPORT, UNITED INFORMATION SERVICES, INCORPORATED, CDC CYBER 175, CDC COBOL 5.3 LEVEL 552
19 Nov. 1983 34 p refs
(PB84-156587; OIT/FSTC-83/281) Avail: NTIS
HC A03/MF A01 CSCL 09B

Technical Report for the United Information Services, Inc., CDC COBOL 5.3 Level 552 running under the APEX Delta 4.7.3 provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the Debug, Level 2; Indexed I-O, Level 1 and 2; Inter-Program Communication; Level 2; Library, Level 2; Nucleus, Level 2; Relative I-O, Level 2; Segmentation, Level 2; Sequential, Level 2; Sort-Merge, Levels 1 and 2; Table Handling, Level 2 of the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). All the discrepancies found, if any, are given. GRA

N84-24252# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
WANG LABORATORIES, INCORPORATED, VS-100 VS COBOL, VERSION 3.8.1 Validation Summary Report
22 Nov. 1983 54 p refs
(PB84-156595; OIT/FSTC-83/315) Avail: NTIS
HC A04/AMF A01 CSCL 09B

Validation Summary Report (VSR) for the Wang Laboratories, Inc., VS COBOL, Version 3.8.1 (Pre-Release) running under the VS, Version 6.19.6 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the level of FIPS PUB 21-1. All the discrepancies found, if any, are given. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N84-24253# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
COBOL TECHNICAL REPORT, WANG LABORATORIES, INCORPORATED, VS-100 VS COBOL VERSION 3.8.1 Validation Summary Report
22 Nov. 1983 13 p refs
(PB84-156678; OIT/FSTC-83/316) Avail: NTIS
HC A02/MF A01 CSCL 09B

A Technical Report for the Wang Laboratories, Inc., VS COBOL, Version 3.8.1 (Pre-Release) running under the VS, Version 6.19.6 provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the Indexed I-O, Level 1 of the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). All the discrepancies found, if any, are given. GRA

N84-24254# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
BURROUGHS CORPORATION B7800, LARGE SYSTEMS BASIC 3.4.1
16 Jan. 1984 10 p refs
(PB84-157379; OIT/FSTC-83/327) Avail: NTIS
HC A02/MF A01 CSCL 09B

A Validation Summary Report (VSR) for the Burroughs Corporation, Large Systems BASIC III.4.1 running under the 000.4.1 provides a consolidated summary of the results obtained from the validation of the subject compiler against the BASIC Standard (X3.60-1978/FIPS PUB 68). The compiler was validated against the Minimal BASIC level of FIPS PUB 68. The discrepancies found, if any, are given. These include an overview of the validation which lists all categories of discrepancies within X3.60-1978 and a detailed listing of discrepancies together with the tests which failed. GRA

N84-24255# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
IBM CORPORATION, IBM 5360 MODEL B24, SYSTEM/36 BASIC RELEASE 1 (5727-BL1)
21 Oct. 1983 16 p refs
(PB84-157171; OSD/FSTC-83/267) Avail: NTIS
HC A02/MF A01 CSCL 09B

Validation summary Report (VSR) for the IBM Corporation, SYSTEM/36 BASIC Release 1 (5727-BL1) running under the IBM SYSTEM/36 System Support Program Product Release 1 (5727-SS1) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 BASIC Standard (X3.60-1978/FIPS PUB 68). The compiler was validated against the Minimal BASIC level of FIPS PUB 68. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies within X3.60-1978 and a detailed listing of discrepancies together with the tests which failed. GRA

N84-24256# Office of Naval Research, London (England). Federal Software Testing Center.
SOFTWARE TOOLS SURVEY
24 Jun. 1983 302 p
(PB84-145572; OSD/FSTC-83/015) Avail: NTIS
HC A14/MF A01 CSCL 09B

Software tools currently available in the market place are identified and categorized. Software tools are computer programs that can automate some of the labor involved in the management, design, coding testing, inspection, or maintenance of other computer programs. A single tool may have application in only one software life cycle stage or may be used to produce products at several different life cycle stages. Software development/management methodologies, historically, required a multitude of tasks performed by analysts, programmers and other support personnel. Software tools are used to replace manual activities. The immediate benefit from their use is a reduction in software development time and cost. Long term benefits include: standardization of development techniques and documentation, reusable code, development of metrics, adaptability to changing environments, and a substantial upgrade in personnel skills. GRA

N84-24257# Office of Naval Research, London (England). Federal Software Testing Center.
VALIDATION SUMMARY REPORT, UNITED INFORMATION SERVICES, INC., CDC CYBER 175, CDC COBOL 5.3 LEVEL 552
19 Nov. 1983 53 p
(PB84-156679; OIT/FSTC-83/280) Avail: NTIS
HC A04/MF A01 CSCL 09B

A Validation Summary Report (VSR) for the United Information Services, Inc., CDC COBOL 5.3 Level 552 running under the APEX Delta 4.7 3 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS 21-1). The compiler was validated against the Low-intermediate level of FIPS PUB 21-1. All the discrepancies found, if any, are given. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974. The categories of discrepancies are related to each of the Federal Levels of the language. A detailed listing of discrepancies together with the tests which failed is given. GRA

N84-24258# Office of Naval Research, London (England). Federal Software Testing Center.
VALIDATION SUMMARY REPORT, DATA GENERAL CORPORATION, ECLIPSE MV/8000, AOS/VS COBOL REVISION 2.18
22 Dec. 1983 57 p
(PB84-156116; OIT/FSTC-83/300) Avail: NTIS
HC A04/MF A01 CSCL 09B

A Validation Summary Report (VSR) for the Data General

Corporation, AOS/VS COBOL Revision 2.18 running under the AOS/VS Revision 3.06 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the Low-Intermediate level of FIPS PUB 21-1. All the discrepancies found, if any, are given. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N84-24259# Office of Naval Research, London (England). Federal Software Testing Center.
VALIDATION SUMMARY REPORT, NCR CORPORATION, NCR V8585, VRX FORTRAN VERSION 25
29 Dec. 1983 13 p
(PB84-156108; OIT/FSTC-83/331) Avail: NTIS HC A02/MF A01 CSCL 09B

A Validation Summary Report (VSR) for the NCR Corporation, VRX FORTRAN Version 25 running under the VRX Release 11 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Full Level FORTRAN level of FIPS PUB 69. The discrepancies found, if any, are given. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N84-24181# Atlanta Univ., Ga. Dept. of Mathematical and Computer Sciences.
ON THE CONVERSION OF LINPACK TO ADA
B. J. Martin and R. Bozeman *In* Army Research Office Trans. of the 1st Army Conf. on Appl. and Computing Feb. 1984 p 167-176 Prepared in cooperation with Morehouse Coll., Atlanta, Ga. (For primary document see N84-24173 14-59)
(AD-P002941) Avail: NTIS HC A99/MF A01 CSCL 09/2

N84-24187# Pittsburgh Univ., Pa. Dept. of Mathematics and Statistics.
DIAGNOSTIC ALGORITHMS FOR CONTOUR DYNAMICS
E. A. Overman, II and N. J. Zabusky *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 269-287 (For primary document see N84-24173 14-59)
(AD-P002947) Avail: NTIS HC A99/MF A01 CSCL 12/1

N84-24202# Ni-Tec, Inc., Niles, Ill.
AN INTRODUCTION TO GEOMETRIC PROGRAMMING
P. D. Allen and D. W. Baker *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 587-600 Prepared in cooperation with Getty Oil Co., Los Angeles (For primary document see N84-24173 14-59)
(AD-P002962) Avail: NTIS HC A99/MF A01 CSCL 12/1

N84-24203# Atlanta Univ., Ga. Dept. of Mathematical and Computer Sciences.
SPACE AND TIME ANALYSIS IN DYNAMIC PROGRAMMING ALGORITHMS
N. A. Warsi and C. B. Setzer *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 601-604 (For primary document see N84-24173 14-59)
(AD-P002963) Avail: NTIS HC A99/MF A01 CSCL 09/2

N84-24205# Technische Hochschule, Aachen (West Germany).
DECISION ALGORITHMS IN FUZZY SITUATIONS
H. J. Zimmermann *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 705-733 (For primary document see N84-24173 14-59)
(AD-P002968) Avail: NTIS HC A99/MF A01 CSCL 12/1

62 COMPUTER SYSTEMS

Includes computer networks.

N84-24260# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
CRONUS: A DISTRIBUTED OPERATING SYSTEM Interim Technical Report, 8 Jun. 1981 - 30 Jun. 1982
R. Schantz, E. Burke, S. Geyer, M. Hoffman, and A. Lake Griffiss AFB, N.Y. RADC Nov. 1983 233 p
(Contract F30602-81-C-0132; AF Proj. 2530)
(AD-A139588; BBN-5086; RADC-TR-83-236; ITR-1) Avail: NTIS HC A11/MF A01 CSCL 09/2

This report describes the primary functional capabilities which will be designed into the Distributed Operating System to be designed and implemented. The goals include coherence and uniformity in the user model of the system, survivability and integrity of the system function and data, scalability of the architecture, resource management, component substitutability, and operation and maintenance procedures. The concept of a virtual Local Network, making it possible to substitute a variety of local area network vendor products in the architecture, is described. Author (GRA)

N84-24261# Integrated Systems, Inc., Palo Alto, Calif.
MODULAR COMPUTING NETWORKS: A NEW METHODOLOGY FOR ANALYSIS AND DESIGN OF PARALLEL ALGORITHMS/ ARCHITECTURES
H. Lev-Ari Dec. 1983 93 p
(Contract N00014-83-C-0377)
(AD-A139600; ISI-29) Avail: NTIS HC A05/MF A01 CSCL 12/1

Several methods for modeling and analysis of parallel algorithms and architecture have been proposed in the recent years. These include recursion-type methods, like recursion equations, z-transform descriptions and 'do-loops' in high-level programming languages, and precedence-graph-type methods like data-flow graphs (marked graphs) and related Petri-net derived models. This paper presents a new methodology for modeling and analysis of parallel algorithms and architectures. This methodology provides a unified conceptual framework that clearly displays the key properties of parallel systems. This methodology is largely based upon the theory of directed graphs and can, therefore, be expressed both informally, in pictorial fashion, and formally, in the language of precedence relations and compositions of functions. This duality will, hopefully, help to bridge the gap between the two schools of research in this field. GRA

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N84-24262# University of Southern California, Marina del Rey. Information Sciences Inst.
SYSTEMIC GRAMMAR IN COMPUTATION: THE NIGEL CASE
C. M. I. M. Matthiessen Feb. 1984 14020 p Presented at the 1st Conf. of the European Chapter of the Assoc. for Computational Linguistics, Pisa, Italy, 1-2 Sep. 1983
(Contract F49620-79-C-0181)
(AD-A139251; ISI/RS-83-121) Avail: NTIS HC A02/MF A01 CSCL 05/7

Systemic grammar, the framework developed by M.A.K. Halliday and others, has been used successfully in the service of computational linguistic tasks, both in generation and in parsing. Currently a large computational systemic grammar of English, the Nigel grammar, is being developed for text generation. This report uses this grammar for an examination of what the design properties of systemic grammar are that make it attractive for text generation. In particular, the functional character of the grammar and its organization around the notion of choice are presented. The generation of one example is discussed. Author (GRA)

N84-24263# Naval Postgraduate School, Monterey, Calif.
THE NORMAL APPROXIMATION AND QUEUE CONTROL FOR RESPONSE TIMES IN A PROCESSOR-SHARED COMPUTER SYSTEM MODEL
D. P. Gaver, P. A. Jacobs, and G. Latouche Feb. 1984 30 p (RR0-1405)
(AD-A139587; NPS55-84-001) Avail: NTIS HC A03/MF A01 CSCL 09/2

The authors present a time-shared computer system as a group of N terminals, each having submission rate lambda and exponential (micron) task durations, with tasks submitted to a central (single) processor. There these are serviced in processor-sharing or time-sliced mode. It is shown that the R(t), the response time conditional on t, the required processing time, becomes approximately normally distributed as t increases. Similar results are derived when N increases. Variations of the model consider control: an inside, processor-shared queue services at most c tasks, others queueing first-come first-served outside. Other possibilities are described and analyzed. Author (GRA)

N84-24189# Wayne State Univ., Detroit, Mich. Dept. of Mathematics.
ON THE CONTROL OF A LINEAR STOCHASTIC SYSTEM WITH FINITE HORIZON
P. L. Chow and J. L. Menaldi *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 301-310 (For primary document see N84-24173 14-59)
(Contract DAAG29-83-K-0014)
(AD-P002949) Avail: NTIS HC A99/MF A01 CSCL 12/1

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N84-24264# Grenoble-1 Univ. (France).
ANNALS OF THE FOURIER INSTITUTE, VOLUME 33, NO. 3 [ANNALES DE LINSTITUT FOURIER, TOME 33, FASCICULE 3]
B. Malgrange, ed. 1983 293 p refs Partly in FRENCH and ENGLISH
(ISSN-0373-0956) Avail: NTIS HC A13/MF A01

Various topics in number theory, field theory and special algebras, and analytic functions of complex variables are addressed. Holomorphic and entire functions are specifically discussed along with operations on and types of manifolds, and convex integration of nonlinear systems of partial differential equations. For individual titles, see N84-24265 through N84-24275.

N84-24265# Illinois Univ., Urbana. Dept. of Mathematics.
ON THE MOMENTS OF AN ADDITIVE FUNCTION [SUR LES MOMENTS D'UNE FONCTION ADDITIVE]
Adolf Hildebrand *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 33, No. 3 1983 p 1-22 refs In FRENCH; ENGLISH summary (For primary document see N84-24264 14-64)
Avail: NTIS HC A13/MF A01

Precise estimations are given for the quantities 1/x the sum of all terms n < or = X modulus [f(n)-A] (beta), where f is an additive arithmetical function and A, beta > O and x > or = 1 are real numbers. M.G.

N84-24266# Ecole Polytechnique, Palaiseau (France). Centre de Mathematiques.
KATO'S CLASS FIELD THEORY AND ABELIAN COVERINGS OF SURFACES [THEORIE DU CORPS DE CLASSES DE KATO ET REVETEMENTS ABELIENS DE SURFACES]
Jean-Luc Brylinski *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 33, No. 3 1983 p 23-38 refs In FRENCH; ENGLISH summary (For primary document see N84-24264 14-64)
Avail: NTIS HC A13/MF A01

Some elementary applications of the class field theory (in dimensions 1 and 2) developed by Kato and Parshin are given: computation of the conductor of a Witt-artin-Schreier extension of a local field of dimension 1, and study of abelian coverings of surfaces. M.G.

N84-24267# Nagoya Univ. (Japan). Dept. of Mathematics.
THE DEFICIENCY OF ENTIRE FUNCTIONS WITH FEJER GAPS
Takafumi Murai *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 33, No. 3 1983 p 39-58 refs (For primary document see N84-24264 14-64)
Avail: NTIS HC A13/MF A01

An entire function f(z) = Sigma (infinity, k=O) a sub k Z(nk) (o = n sub o <n sub 1 <n sub 2 <...) has Fejer gaps if Sigma(infinity,k=:11) 1/n sub k < infinity. It is demonstrated that an entire function with Fejer gaps has no finite deficient value. M.G.

N84-24268# Toulouse Univ. (France).
EXTENSION IN HARDY CLASSES OF HOLOMORPHIC FUNCTIONS AND CARLESON MEASURES EXTIMATES FOR THE BAR DELTA EQUATION [EXTENSION DANS DES CLASSES DE HARDY DE FONCTIONS HOMOMORPHES ET ESTIMATIONS DE TYPE MESURES DE CARLESON POUR L'EQUATION BAR DELTA]
Anne Cumenge *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 33, No. 3 1983 p 59-97 refs In FRENCH; ENGLISH summary (For primary document see N84-24264 14-64)
Avail: NTIS HC A13/MF A01

A holomorphic function f on a subvariety V in general position in a bounded strictly pseudo-convex domain D in C(n) can be extended in H(e)(D) (1< or = P< + infinity) if and only if a weighted L(p)-condition is satisfied by f; a main tool in proving this result is to solvea BAR-DELTA - equation with Carleson measures - like estimates. M.G.

N84-24269# Hokkaido Univ., Sapporo (Japan). Dept. of Mathematics.
UNFOLDINGS OF FOLIATIONS WITH MULTIFORM FIRST INTEGRALS
Tatsuo Suwa *In* Grenoble-1 Univ. Ann. of the Fourier Inst, Vol. 33, No. 3 1983 p 99-112 refs (For primary document see N84-24264 14-64)
Avail: NTIS HC A13/MF A01

Let F = (omega) be a codim 1 local foliation generated by germ omega of the form omega=f sub 1... f sub p the sum to p terms(i=1) lambda sub i (df sub i/f sub i) for some complex numbers lambda sub; and germs f sub i of holomorphic functions at the origin in C(n). Under some conditions, the set of equivalence classes of first order unfoldings is determined and a universal unfoldng of F is constructed explicitly. Special cases of this include foliations with holomorphic or meromorphic first integrals. It is also shown that the unfolding theory for F is equivalent to the unfoldng theory for the multiform function f= F sub 1 (lambda sub 1)... f sub p (lambda sub p). M.G.

N84-24270# Paris-Sud Univ., Orsay (France).
A RESULT ON EXTENSION OF C.R. FUNCTIONS
M. Derridj and J. E. Fornaess (Princeton Univ.) *In* Grenoble-1 Univ. Ann. of the Fourier Inst, Vol. 33, No. 3 1983 p 113-120 refs (For primary document see N84-24264 14-64)
Avail: NTIS HC A13/MF A01

Let Omega be an open set in C(n), C(4) near z sub 0 is an element of delta Omega, lambda a suitable holomorphic function near z sub 0. If one can solve the following problem: bar-delta u = lambda f, (f is a(0,1) form, bar-delta is closed in U(z sub o)) in U(z sub o), with supp(u) contained in bar-Omega and the intersection with U(z sub o); then an extension result is deduced for C.R. functions on delta Omega contained in U(z sub o), as holomorphic functions in Omega contained in V(z sub o). M.G.

N84-24271# York Univ., Downsview (Ontario). Dept. of Mathematics.
CONVEX INTEGRATION OF NON-LINEAR SYSTEMS OF PARTIAL DIFFERENTIAL EQUATIONS

David Spring *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 33, No. 3 1983 p 121-177 refs (For primary document see N84-24264 14-64)
Avail: NTIS HC A13/MF A01

Geometrical techniques are employed to prove a global existence theorem for C(r)-solutions to underdetermined systems of non-linear R-th order partial differential equations, R is an element of (1,2,3,...), which satisfy certain convexity conditions. The solutions are not unique, but satisfy given approximations on lower order derivatives. The main result, which includes the relative case generalizes the work of M. Gromov on non-linear first order systems. M.G.

N84-24272# Liege Univ. (Belgium). Inst. de Mathematique.
ANALYTIC WAVE FRONT AND MICROLOCAL DECOMPOSITION DISTRIBUTIONS [FRONT D'ONDE ANALYTIQUE ET DECOMPOSITION MICROLOCALE DES DISTRIBUTIONS]
Pascal Laubin *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 33, No. 3 1983 p 179-199 refs In FRENCH; ENGLISH summary (For primary document see N84-24264 14-64)
Avail: NTIS HC A13/MF A01

A microlocal analytic representation of the distribution Delta(x - y) is studied extensively. An expression of this distribution as an integral of distributions singular at only one point and one codirection is provided. This splitting is obtained by using Fourier-integral-operators with complex valued phases. This tool is used to prove the theorem of decomposition of the analytic wave front set of distributions. Some theorems related to the global representation of distributions in terms of boundary values of holomorphic functions are also proved. M.G.

N84-24273# Paris VI Univ. (France). Lab. de Mathematiques Fondamentales.
STABILITY OF C* ALGEBRAS OF A FOLLIATED MANIFOLD [STABILITE DES C*-ALGEBRES DE FEUILLETAGES]
M. Hilsum and G. Skandalis *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 33, No. 3 1983 p 201-208 refs In FRENCH; ENGLISH summary (For primary document see N84-24264 14-64)
Avail: NTIS HC A13/MF A01

Let A be either the reduced or the maximal C(*)-algebra associated to a foliated manifold (V, F), and let K be the elementary C(*)-algebra of compact operators. Then, if dim F = or / 0, it is shown that A is isomorphic to the tensor product A x K. M.G.

N84-24274# Kyoto Univ. (Japan). Research Inst. for Mathematical Sciences.
CLASSIFICATION OF NASH MANIFOLDS **c67**
Masahiro Shiota *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 33, No. 3 1983 p 209-232 refs (For primary document see N84-24264 14-64)
Avail: NTIS HC A13/MF A01

A semi-algebraic analytic manifold and a semi-algebraic analytic map are called a Nash manifold and a Nash map respectively. The categories of Nash manifolds and Nash maps are clarified. Author

N84-24275# Paris-Sud Univ., Orsay (France).
DENSITY AND DIMENSION [DENSITE ET DIMENSION]
Patrick Assouad *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 33, No. 3 1983 p 233-282 refs In FRENCH; ENGLISH summary (For primary document see N84-24264 14-64)
Avail: NTIS HC A13/MF A01

A class S of subsets of a set X is called a Vapnik-Cervonenkis class if the growth of the function Delta(S): R approaches Sup[/intersection of A and S//A is a subset of X,/A/=R] is polynomial. These classes are useful in statistics and probability. The Vapnik-Cervonenkis classes are surveyed and several results are proved. It is shown that a subset of S of 2(x) is a Vapnik-Cervonenkis class if and only if the number of atoms of the sigma-algebra generated by any collection of r members of S if no more than Cr(s) (where C and s are two positive real numbers). M.G.

N84-24276*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AN EXPLICIT PREDICTOR-CORRECTOR SOLVER WITH APPLICATIONS TO BURGERS' EQUATION
Suhrit K. Dey and Charlie Dey (Country Lane School, San Jose, Calif.) Sep. 1983 29 p refs
(NASA-TM-84402; A-9475; NAS 1.15:84402) Avail: NTIS HC A03/MF A01 CSCL 12A

Forward Euler's explicit, finite-difference formula of extrapolation, is used as a predictor and a convex formula as a corrector to integrate differential equations numerically. An application has been made to Burger's equation. B.W.

N84-24277# Yale Univ., New Haven, Conn. Dept. of Computer Science.
SINGULAR VALUE COMPUTATIONS WITH SYSTOLIC ARRAYS
I. C. F. Ipsen Nov. 1983 52 p
(Contract N00014-82-K-0184)
(AD-A139302; YALEU/DCS/RR-291) Avail: NTIS HC A04/MF A01 CSCL 12/1

Systolic arrays are constructed for bandwidth reduction and singular value decomposition of m x n matrices, wlog, m < or = n. The underlying algorithms are unconditionally stable. Since input and output occurs, as in previous designs, by diagonals arrays can be directly appended to further reduce the computation time. Consequently, the designs will be most efficient for matrices with a fairly small and dense band. GRA

N84-24278# Yale Univ., New Haven, Conn. Dept. of Computer Science.
SOLVING THE POISSON EQUATION ON THE FPS-164 (FLOATING POINT SYSTEM-164)
S. T. ODonnell, P. Geiger, and M. H. Schultz Nov. 1983 30 p
(Contract N00014-82-K-0184; Grant NSF MCS-81-06181)
(AD-A139307; YALEU/DCS/TR-293) Avail: NTIS HC A03/MF A01 CSCL 12/1

The architectural differences between a serial and a parallel machine raise a number of questions regarding the efficiency of established algorithms. This paper explores several algorithms which solve the Poisson equation on rectangular regions in two dimensions. The solution of the Poisson problem is an example of one of the simplest nontrivial computations which frequently occur in innermost loops of large scale scientific codes, and hence is a useful test of different architectures for scientific computation. Compared are solution times on the VAX 11/780 with solution times on the Floating Point System 164 (FPS-164) attached processor. Since the FPS-164 supports a sufficiently large memory and the host/attached processor I/O is relatively slow, it is of interest to solve large problems entirely on the FPS-164. We explore the performance of the FPS-164 on both portable FORTRAN programs which have not been tuned to its architecture and on moderately tuned FORTRAN programs which make calls to the FPS assembly language math library, MATHLIB. Use of MATHLIB results in shorter programs which are usually more efficient. We show that the speedup in execution time is more uniform across the algorithms than might be anticipated and hence the choice of algorithm is still highly significant. GRA

N84-24279# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
CHARACTERIZATION AND ESTIMATION OF 2-DIMENSIONAL ARMA (AUTOREGRESSIVE MOVING AVERAGE) MODELS
R. L. Kashyap Sep. 1983 34 p
(Contract N00014-82-K-0360)
(AD-A139120; TR-EE-83-34) Avail: NTIS HC A03/MF A01 CSCL 12/1

A class of finite order two dimensional autoregressive moving average (ARMA) is introduced having the ability to represent any process with rational spectral density. In this model, the driving noise is correlated and need not be Gaussian. Currently known classes of ARMA models of AR models are shown to be subsets of the above class. This document discusses the three definitions

of Markov property and precisely states the class of ARMA model having the noncausal and semicausal Markov property without imposing any specific boundary conditions. Next it considers the estimation of parameters of a model to fit a given image. Two approaches are considered. The first method uses only the empirical correlations and involves the solution of linear equations. The second method is the likelihood approach. Since the exact likelihood function is difficult to compute, the author resorts to approximations suggested by the torodial models. The quality of th two estimation schemes are compared via numerical experiments. Finally, he considers the problem of synthesizing a texture obeying an ARMA model. Author (GRA)

N84-24280# Massachusetts Inst. of Tech., Cambridge. Lab. for Artificial Intelligence.

FINGERPRINT THEOREMS FOR ZERO-CROSSINGS

A. L. Yuille and T. Poggio Oct. 1983 14029 p

(Contract N00014-80-C-0505)

(AD-A139181; AI-M-730) Avail: NTIS HC A03/MF A01 CSCL 12/1

It is proven that the scale map of the zero-crossings of almost all signals filtered by the second derivative of a Gaussian of variable size determines the signal uniquely, up to a constant scaling and a harmonic function. The authors' proof provides a method for reconstructing almost all signals from knowledge of how the zero-crossing contours of the signal, filtered by a Gaussian filter, change with the size of the filter. The proof assumes that the filtered signal can be represented as a polynomial of finite, albeit possibly very high, order. An argument suggests that this restriction is not essential. Stability of the reconstruction scheme is briefly discussed. The result applies to zero- and level-crossings of linear differential operators of Gaussian filters. The theorem is extended to two dimensions, that is to images. These results are reminiscent of Logan's theorem. These imply that extreme of derivatives at different scales are a complete representation of a signal.

Author (GRA)

N84-24281# Yale Univ., New Haven, Conn. Dept. of Computer Science.

A PARALLEL QR METHOD USING FAST GIVENS' ROTATIONS

I. C. F. Ipsen Jan. 1984 17 p

(Contract N00014-82-K-0184)

(AD-A139184; YALEU/DCS/RR-299) Avail: NTIS HC A02/MF A01 CSCL 12/1

Given a prescribed order in which to introduce zeroes, and constraints on the architecture it is shown how to develop a parallel QR factorization based on fast Givens' rotations for a rectangular array of processors, suitable to VLSI implementation. Unlike designs based on standard Givens' transformations, the present one requires no square root computations. Assuming each processor performs the elementary operations (+,*,/), less than O(w sub 2) processors can achieve the decomposition of a w-banded, order n matrix in time O(n). Application is made to a variant of Bareiss' G-Algorithm for the solution of weighted multiple linear least squares problems. Given k different right hand side vectors, (w sub 2) processors compute the factorization in O(n + k) steps.

Author (GRA)

N84-24282# Wisconsin Univ., Madison. Mathematics Research Center.

REMARKS ON THE AMBROSETTI-PRODI PROBLEM Technical Summary Report

D. G. Costa and D. G. DeFigueiredo Jan. 1984 17 p

(Contract DAAG29-80-C-0041)

(AD-A139237; MRC-TSR-2633) Avail: NTIS HC A02/MF A01 CSCL 12/1

The Ambrosetti-Prodi boundary value problem with an asymptotically linear nonlinearity is considered. Under general conditions on the nonlinearity it is shown that there exist positive and negative solutions. In the case when the domain is a ball in R sub n and the nonlinearity crosses the first n eigenvalues, corresponding to radial eigenfunctions, it is proved that there are at least n + 1 radial solutions. Author (GRA)

N84-24283# Wisconsin Univ., Madison. Mathematics Research Center.

THE NUMERICAL CALCULATION OF TRAVELING WAVE SOLUTIONS OF NONLINEAR PARABOLIC EQUATIONS ON THE LINE Technical Summary Report

T. Hagstrom and H. B. Keller Feb. 1984 19 p

(Contract DAAG29-80-C-0041)

(AD-A139238; MRC-TSR-2646) Avail: NTIS HC A02/MF A01 CSCL 12/1

The long time behavior of the solutions of nonlinear parabolic initial value problems on the line has been investigated by many authors. In particular they have shown, under certain assumptions, the existence of traveling waves to which a large class of initial data eventually evolves. They have also proved that which traveling wave solution is picked out as the asymptotic state often depends on the behavior of the initial data at infinity. This causes difficulties for the numerical simulation of the long time evolution of such problems. In particular, if an artificial boundary is introduced, the boundary condition imposed there must depend on the initial data in the discarded region. This work derives such boundary conditions, based on the Laplace transform solution of the linearized problems at + or - infinity. The authors illustrate their utility by presenting a numerical solution of Fisher's equation, a nonlinear parabolic equation with traveling wave solutions which has been proposed as a model in genetics. Author (GRA)

N84-24284# Wisconsin Univ., Madison.

MULTIVARIATE PERPENDICULAR INTERPOLATION Technical Summary Report

P. Alfeld Feb. 1984 27 p

(Contracts DAAG29-80-C-0041; DE-AL02-82ER-12046)

(AD-A139254; MRC-TSR-2641) Avail: NTIS HC A03/MF A01 CSCL 12/1

An approach to multivariate interpolation is described. The algorithm is applicable in arbitrary dimensions, and can generate surfaces of arbitrary smoothness. This is accomplished by tesselating the (polyhedral) domain into simplices and using one dimensional algorithms to construct interpolants first on edges and then successively on higher order faces by blending methods. The result is a piecewise rational function of a high degree which has the prescribed global smoothness and interpolates to the original data. The interpolants are local, i.e., their evaluation at a point requires only data on the simplex that the point resides in. The schemes require data of the same degree as the degree of global smoothness. The degree of polynomial precision is greater than or equal to the degree of smoothness. The approach derives its power and simplicity from the fact that derivatives in directions perpendicularly across faces are incorporated directly as data.

Author (GRA)

N84-24285# Wisconsin Univ., Madison. Mathematics Research Center.

ON THE TAYLOR APPROXIMATION OF CONTROL SYSTEMS Technical Summary Report

A. Bressan Jan. 1984 22 p

(Contract DAAG29-80-C-0041)

(AD-A139255; MRC-TSR-2635) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper provides a simple method of constructing approximations which can be used for a systematic study of a control system over a short interval of time, in much the same way as the classical Taylor expansion is used to study the local properties of differentiable functions. GRA

N84-24286# Wisconsin Univ., Madison. Mathematics Research Center.

ON A THEOREM OF SZEGOE ON UNIVALENT CONVEX MAPS OF THE UNIT CIRCLE Technical Summary Report

I. J. Schoenberg Feb. 1984 18 p

(Contract DAAG29-80-C-0041)

(AD-A139256; MRC-TSR-2647) Avail: NTIS HC A02/MF A01 CSCL 12/1

There is a fine interplay between two fundamental notions of

geometry: Convexity and Conformal Mapping. The subject belongs to Geometric Function Theory. In 1928 Gabor Szegoes showed that if a power series converges in the unit circle absolute value z < 1 and maps it onto a convex domain, then all its finite sections map the circle absolute z < 1/4 onto convex domains. The present paper shows that Szegoes theorem reduces to a study of the finite sections of the geometric series 1 + 1/4 z + 1/16 z squared + ... = 1/4 to the (n) power ... z to the (n) power. The main tool is a result conjectured in 1958 by Polya and Schoenberg, but only established in 1973 by St. Ruscheweyh and T. Sheil-Small. GRA

N84-24287# Wisconsin Univ., Madison. Mathematics Research Center.
THE DIRICHLET PROBLEM FOR HARMONIC MAPS FROM THE DISK INTO THE EUCLIDEAN n-SPHERE Technical Summary Report
V. Benci and J. M. Coron Jan. 1984 36 p
(Contract DAAG29-80-C-0041)
(AD-A139259; MRC-TSR-2636) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper studies harmonic maps when omega is the two dimensional disk and M = sub n. In this situation, given a smooth function gamma from curly d omega to sub n we prove that if gamma is not constant, there exist two harmonic functions u such that u/curly d omega = gamma. GRA

N84-24288# Wisconsin Univ., Madison. Mathematics Research Center.
LOCAL ASYMPTOTIC APPROXIMATION OF NONLINEAR CONTROL SYSTEMS Technical Summary Report
A. Bressan Feb. 1984 21 p
(Contract DAAG29-80-C-0041)
(AD-A139260; MRC-TSR-2640) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper describes a canonical method to locally approximate any family (g sub 1, ..., g sub m) of vector fields by one which generates a nilopotent Lie algebra. This is particularly useful in control theory, because it shows that an arbitrary control system can locally be obtained from a small perturbation of nilopotent system, by a suitable rescaling of the coordinates. GRA

N84-24289# Wisconsin Univ., Madison. Mathematics Research Center.
UNIQUENESS OF CONNECTING ORBITS IN THE EQUATION Y(3) = Y2 - 1 Technical Summary Report
C. K. McCord Jan. 1984 14 p
(Contract DAAG29-80-C-0041)
(AD-A139261; MRC-TSR-2628) Avail: NTIS HC A02/MF A01 CSCL 12/1

The differential equation of the title arises (in particular) in the study of shock waves. The equation has two rest points; the question is whether there are solutions running between them. Existence of the connecting solution was proved in previous works. The uniqueness is proved in this paper. GRA

N84-24290# Wisconsin Univ., Madison. Mathematics Research Center.
ON THE EQUIDECOMPOSABILITY OF A REGULAR TRIANGLE AND A SQUARE OF EQUAL AREAS Technical Summary Report
D. W. Crowe and I. J. Schoenberg Jan. 1984 9 p
(Contract DAAG29-80-C-0041)
(AD-A139270; MRC-TSR-2632) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper deals with the subject of the first chapter of the second author's book Mathematical Time Exposures: The equidecomposability of a regular triangle and a square of equal areas. A new solution of the problem is given, which also shows that the solution of the problem as given in the third edition of Hogo Steinhaus Mathematical Snapshots is not correct. Author (GRA)

N84-24291# Yale Univ., New Haven, Conn. Dept. of Computer Science.
A HYBRID CHEBYSHEV KRYLOV SUBSPACE ALGORITHM FOR SOLVING NONSYMMETRIC SYSTEMS OF LINEAR EQUATIONS
H. C. Elman, Y. Saad, and P. E. Saylor Feb. 1984 23 p
(Contracts N00014-82-K-0184; DAAG29-83-K-0177)
(AD-A139301; YALEU/DCS/TR-301) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document presents an iterative method for solving large sparse nonsymmetric linear systems of equations that enhances Manteuffel's adaptive Chebyshev method with a conjugate gradient-like method. The new method replaces the modified power method for computing needed eigenvalue estimates with Arnoldi's method, which can be used to simultaneously compute eigenvalues and to improve the approximate solution. Convergence analysis and numerical experiments suggest that the method is more efficient than the original adaptive Chebyshev algorithm. Author (GRA)

N84-24292# Wisconsin Univ., Madison. Mathematics Research Center.
EXACT BOUNDARY CONDITIONS AT AN ARTIFICIAL BOUNDARY FOR PARTIAL DIFFERENTIAL EQUATIONS IN CYLINDERS Technical Summary Report
T. Hagstrom and H. B. Keller (California Inst. of Technology, Pasadena) Jan. 1984 32 p
(Contracts DAAG29-80-C-0041; DE-AS03-76SF-00767)
(AD-A139310; MRC-TSR-2626) Avail: NTIS HC A03/MF A01 CSCL 12/1

The numerical solution of partial differential equations in unbounded domains requires a finite computational domain. Often one obtains a finite domain by introducing an artificial boundary and imposing boundary conditions there. This paper derives exact boundary conditions at an artificial boundary for partial differential equations in cylinders. An abstract theory is developed to analyze the general linear problem. Solvability requirements and estimates of the solution of the resulting finite problem are obtained by use of the notions of exponential and ordinary dichotomies. Useful representations of the boundary conditions are derived using separation of variables for problems with constant tails. The constant tail results are extended to problems whose coefficients obtain limits at infinity by use of an abstract perturbation theory. The perturbation theory approach is also applied to a class of nonlinear problems. General asymptotic formulas for the boundary conditions are derived and displayed in detail. Author (GRA)

N84-24293# Wisconsin Univ., Madison. Mathematics Research Center.
ON THE ALMOST PERIODICITY OF THE SOLUTIONS OF AN INTEGRODIFFERENTIAL EQUATION Technical Summary Report
O. J. Staffans Feb. 1984 25 p
(Contract DAAG29-80-C-0041)
(AD-A139312; MRC-TSR-2642) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper discusses the almost periodicity of bounded solutions of the integrodifferential equation x' + micron * x = f. Here x and f map R into C sub n, the prime denotes differentiation, micron is an n by n matrix valued finite measure on R, and f is either an almost periodic distribution, or an almost periodic function in the sense of Bohr, Stephanoff, Weyl or Besicovitch. In the first three cases the author gives a simple sufficient condition (countability of the set where the characteristic function of the kernel is not invertible) for bounded solutions to be almost periodic. This condition is no longer sufficient in the last two cases, as is shown with a simple counterexample. Author (GRA)

N84-24294# Wisconsin Univ., Madison. Mathematics Research Center.
ON SMALL PERIOD, LARGE AMPLITUDE NORMAL MODES OF NATURAL HAMILTONIAN SYSTEMS Technical Summary Report
E. W. C. van Groesen Jan. 1984 25 p

(Contract DAAG29-80-C-0041)
(AD-A139314; MRC-TSR-2637) Avail: NTIS HC A02/MF A01 CSCL 12/1

Periodic solutions are investigated of the set of second order Hamiltonian equations -x = V'(x) for x(t) e R sub N, where the function V is even, has a certain monotonic behavior on rays through the origin in R sub N and has superquadratic growth at infinity. It is proven that for T > 0 less than the smallest period of the linearized system (if non-trivial, else for all T), there exists a periodic solution of a special kind, a normal mode, which has minimal period T, has large amplitude (tending to infinity as T approaches limit of 0) and which minimizes the action functional on a naturally constrained set. If V has a direction of maximum increase this solution will be characterized completed. A condition for V is given, which is the same as in a multiplicity result for the prescribed energy case, that provides the existence of at least N distinct normal modes of minimal period T. Author (GRA)

N84-24295# Wisconsin Univ., Madison. Mathematics Research Center.
ESTIMATING TIME AVERAGES VIA RANDOMLY-SPACED OBSERVATIONS Technical Summary Report
B. L. Fox and P. W. Glynn Jan. 1984 24 p
(Contract DAAG29-80-C-0041)
(AD-A139315; MRC-TSR-2638) Avail: NTIS HC A02/MF A01 CSCL 12/1

In many stochastic systems, one is interested in estimating steady-state expected values. When Monte Carlo simulation is used to estimate such parameters, an assessment of accuracy, in the form of confidence intervals, is often required. Most procedures for producing such confidence intervals require that the simulation be sampled so that the time increments between observations are all equal. This is difficult to accomplish in a discrete-event simulation, since the clock which drives the simulation is incremented in a random fashion. To estimate continuous-time averages via randomly-spaced observations of discrete-event systems, the authors develop a point-process framework and use it to generalize both regenerative and stationary-process oriented simulation methodologies. They give consistent estimators, central limit theorems, and an effective bias-reducing jackknife. The impact of indirect estimation of transaction (customer) averages is discussed. GRA

N84-24296# Wisconsin Univ., Madison. Mathematics Research Center.
THE LINEAR QUADRATIC OPTIMAL CONTROL PROBLEM FOR INFINITE DIMENSIONAL SYSTEMS WITH UNBOUNDED INPUT AND OUTPUT OPERATORS Technical Summary Report
A. J. Pritchard and D. Salamon Jan. 1984 105 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-82-10950)
(AD-A139333; MRC-TSR-2624) Avail: NTIS HC A06/MF A01 CSCL 12/1

Part 1 of this paper deals with the problem of designing a feedback control for a linear infinite dimensional system in such a way that a given quadratic cost functional is minimized. The essential feature of this work is that: (1) it allows for unbounded control and observation, i.e., boundary control, point observation, input/output delays; and (2) the general theory is presented in such a way that it applies to both parabolic and hyperbolic partial differential equations as well as retarded and neutral functional differential equations. Part 2 develops a state space approach for retarded systems with delays in both input and output. A particular emphasis is placed on the development of the duality theory by means of two different state concepts. The resulting evolution equations fit into the framework of Part 1. Author (GRA)

N84-24297# National Opinion Research Center, Chicago, Ill.
A RESPONSE MODEL FOR MULTIPLE CHOICE ITEMS
D. Thissen and L. Steinberg Dec. 1983 51 p
(Contract N00014-83-C-0283; F63-521)
(AD-A139396; TR-1) Avail: NTIS HC A04/MF A01 CSCL 12/1

An extension of the Bock-Samejima model for multiple choice items is introduced. The model provides for varying probabilities of the response alternative when the examinee guesses. A marginal maximum likelihood method is devised for estimating the item parameters, and likelihood ratio tests for comparing more and less constrained forms of the model are provided. Applications of the model are illustrated with item response data for the work knowledge and general science subtests of the Armed Services Vocational Aptitude Battery. Author (GRA)

N84-24298# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
DEVELOPING AND MEASURING AN UNDERSTANDING OF THE CONCEPT OF THE LIMIT OF A SEQUENCE Ph.D. Thesis
T. A. Bratina 1983 391 p
(AD-A139399; AFIT/CI/NR-83-90D) Avail: NTIS HC A17/MF A01 CSCL 05/10

This study investigates understanding of limits. The concept of limits is one of the fundamental ideas in mathematics. The limit concept is a broad one. Thus, to establish a focus for this study, the researcher concentrated on limits of sequences. The limit concept is the foundation upon which differential and integral calculus are built. The all important question of whether an infinite series converges or diverges rests with limits of sequences of partial sums. The entire study was related to characterizing and measuring understanding of the concept of the limit of a sequence. The major purposes were: To develop a meaning of the understanding of the limit of a sequence based upon students' behavior, and; to measure the meaning of the understanding of the limit of a sequence. This was to be done by constructing an instrument that is valid, reliable, objective, and suitable for measuring this understanding. The related topic was: To investigate specific subskills that might be related to understanding the concept of the limit of a sequence. GRA

N84-24299# Tel-Aviv Univ. (Israel).
THE EFFICIENT USE OF SPECTRAL AND FINITE DIFFERENCE METHODS FOR THE SOLUTION OF CERTAIN HYPERBOLIC AND PARABOLIC PROBLEMS Final Technical Report
D. Gottlieb and E. Turkel Nov. 1983 4 p
(Contract DAJA38-80-C-0032)
(AD-A139477) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document describes three areas of research in spectral methods. The first area is the theoretical study of spectral methods for hyperbolic and parabolic equations. The second area of research has been to investigate the use of time dependent equations of reach a steady state using spectral methods. The third area of investigation is the study of the time discretization for time dependent hyperbolic equations. Finite difference algorithms are also presented. GRA

N84-24300# Yale Univ., New Haven, Conn. Dept. of Computer Science.
AN APPROXIMATE NEWTON METHOD FOR COUPLED NONLINEAR SYSTEMS
T. F. Chan Feb. 1984 13 p
(Contracts DAAG29-83-K-0177; DE-AC02-81ER-10996)
(AD-A139589; YALEU/DCS/RR-300; ARO-20638.1-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

The author proposes an approximate Newton method for solving a coupled nonlinear system. The method involves applying the basic iteration S of a general solver for the equation G(u,t)=0 with t fixed. It is therefore well-suited for problems for which such a solver already exists or can be implemented more efficiently than a solver for the coupled system. The author derives conditions for S under which the method is locally convergent. Basically, if S is sufficiently contractive for G, then convergence for the coupled system is guaranteed. Otherwise, it shown how to construct a S from S for which convergence is assured. These results are applied to continuation methods where N represents a pseudo-arclength condition. He show that under certain conditions the algorithm converges if S is convergent for G. Author (GRA)

N84-24301# National Academy of Sciences - National Research Council, Washington, D. C. Committee on the Applications of Mathematics.

COMPUTATIONAL MODELING AND MATHEMATICS APPLIED TO THE PHYSICAL SCIENCES
1984 102 p
(Contract DE-FG01-81ER-12001)
(DE84-008252; DOE/ER-12001/T1) Avail: NTIS HC A06/MF A01

This committee concludes that computational modeling, which is a high-leverage element of our nation's scientific and technological effort, requires increased emphasis and support. The conclusion is documented by an examination of typical application areas including aerospace sciences, physical sciences, life sciences, materials science, and electronics. The pervasive difficulties that accompany computation of such realistic problems lead to consideration of what computers can and cannot do currently, along with future capabilities. The committee recommends increased support for research in computational modeling and applied mathematics for computing facilities dedicated to this area, and for education and manpower development in computational and applied mathematics. These recommended increases include financial support from government and industry as well as institutional support from universities. DOE

N84-24302# Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Pure Mathematics.
TWO INFINITE SEQUENCES OF NEAR POLYGONS
A. E. Brouwer and H. A. Wilbrink Jun. 1983 13 p refs Submitted for publication
(MC-ZW-194/83) Avail: NTIS HC A02/MF A01

A geometrically closed subset Y of X such that for any two points all shortest paths between them are contained in Y, and a quad, geodetically closed subspace of X of diameter two with not all of its points adjacent to one fixed point are defined. Near nonregular polygons with quads (a connected partial linear space for O-object (point P) and 2-object (line l), with a unique O-object (point Q) nearest P) in the Fischer groups Sym(2n) and O+(2n.2) are constructed. Two infinite sequences of near polygons are studied. Author (ESA)

N84-24303# Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
NEW VERY LARGE AMICABLE PAIRS
Herman J. J. teRiele May 1983 8 p refs Submitted for publication
(MC-NW-153/83) Avail: NTIS HC A02/MF A01

Computations which produce many very large amicable pairs are described. Two integers amicables with 282 digits are given. Author (ESA)

N84-24304# Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
A COMPARITIVE STUDY OF ADI SPLITTING METHODS FOR PARABOLIC EQUATIONS IN TWO SPACE DIMENSIONS
H. B. deVries Jun. 1983 26 p refs Submitted for publication
(MC-NW-156/83) Avail: NTIS HC A03/MF A01

Numerical integration methods for semidiscrete linear (and nonlinear) parabolic partial differential equations in two space variables are considered. The SC method interpreted as a variant of the method of successives corrections gives an integration step which can be solved by ADI splitting method. The global extrapolation of the locally one dimensional involves parallel integration. Each integration step by an ADI splitting method is solved. Lower frequencies in the initial error and fast convergence are obtained. The ADI splitting method for semidiscrete parabolic equations is better. Author (ESA)

N84-24305# Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
FACTORING MULTIVARIATE POLYNOMIALS OVER ALGEBRAIC NUMBER FIELDS
A. K. Lenstra Jul. 1983 18 p refs Submitted for publication
(MC-IW-233/83) Avail: NTIS HC A02/MF A01

An algorithm to factor multivariate polynomials over algebraic extensions of rational number fields (algebraic number fields) is presented. It is polynomial-time in the degrees of the polynomial in several variables with algebraic number coefficients to be factored. This algorithm is an immediate generalization of the polynomial-time algorithm to factor univariate polynomials with rational coefficients. Author (ESA)

N84-24306# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
ON THE REDUCTION PROCEDURE FOR WEAK CONVERGENCE OF MEASURES
Harald Bergstroeh 1983 10 p refs Submitted for publication
(CTH-Math-1983-19; ISSN-0347-2809) Avail: NTIS HC A02/MF A01

A reduction of weak convergence of measures on normal spaces is presented. Applications and results are stated. Author (ESA)

N84-24307# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
BEST APPROXIMATION IN L SUB P (W) BY ALGEBRAIC POLYNOMIALS
Joergen Loefstroem 1983 43 p refs Submitted for publication
(CTH-Math-1983-20; ISSN-0347-2809) Avail: NTIS HC A03/MF A01

Necessary and sufficient conditions of Ky's method for the Jackson and Bernstein type approximation by algebraic polynomials in Lp-Spaces are generalized. Theory of orthogonal polynomials and theory of interpolation spaces are used. Author (ESA)

N84-24117# Feng Chia Univ., Taichung (Taiwan). Dept. of Information and Computer Engineering.
A STUDY OF REDUCED DEPENDENCE IN MULTI-VALUED SEQUENTIAL MACHINES
T. C. Yang and A. S. Wojcik *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 12-20 refs Prepared in cooperation with Illinois Inst. of Tech., Chicago (For primary document see N84-24115 14-59)
(AD-P002326) Avail: NTIS HC A19/MF A01 CSCL 12/1

N84-24118# Kansai Univ., Osaka (Japan). Faculty of Engineering.
A PREPROCESSING PROCEDURE METHOD IN TERNARY CLAUSE SELECTION
Shigeru Imanishi and Noriaki Muranaka *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 21-26 refs (For primary document see N84-24115 14-59)
(AD-P002327) Avail: NTIS HC A19/MF A01 CSCL 12/1

N84-24120# Kyoto Univ. (Japan). Dept. of Precision Mechanics.
AXIOMATIC CHARACTERIZATION AND COMPARATIVE ANALYSIS OF PREFERENCE ON DESIRABILITY AND POSSIBILITY
Osamu Katai and Sousuke Iwai *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 36-41 refs (For primary document see N84-24115 14-59)
(AD-P002329) Avail: NTIS HC A19/MF A01 CSCL 12/1

N84-24121# Haifa Univ. (Israel). School of Education.
QUOTIENT ALGEBRAS FOR LOGICS OF IMPRECISION
Michael Katz *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 42-46 refs (For primary document see N84-24115 14-59)
(AD-P002330) Avail: NTIS HC A19/MF A01 CSCL 12/1

N84-24122# Naples Univ. (Italy). Ist. di Fisica Teorica.
IN THE LABYRINTH OF MANY VALUED LOGICS
Salvatore Guccione, Settimo Termini (CNR, Naples), and Roberto Tortora *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 47-53 refs (For primary document see N84-24115 14-59)
(AD-P002331) Avail: NTIS HC A19/MF A01 CSCL 12/1

N84-24126# Toyko Univ., Kawagoe (Japan). Dept. of Electrical Engineering.
SYNTHESIS OF MULTIVALUED LOGIC CIRCUITS USING HYPERPLANES
Tatsuki Watanabe and Masayuki Matsumoto *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 72-77 refs (For primary document see N84-24115 14-59)
(AD-P002335) Avail: NTIS HC A19/MF A01 CSCL 12/1

N84-24127# Nagoya Univ. (Japan). Education Center for Information Processing.
P-VALUED INPUT, Q-VALUED OUTPUT THRESHOLD LOGIC AND ITS APPLICATION TO THE SYNTHESIS OF P-VALUED LOGICAL NETWORKS
Takashiro Haga and Teruo Fukumura *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 78-83 refs (For primary document see N84-24115 14-59)
(AD-P002336) Avail: NTIS HC A19/MF A01 CSCL 12/1

N84-24128# Kyoto Univ. (Japan). Faculty of Engineering.
GENERATION OF TERNARY MAJORITY FUNCTIONS OF FOUR OR LESS VARIABLES
Hisashi Mine, Yoshinori Yamamoto (Higashiyamato High School, Tokyo), and Shiro Fujita (Okayama Univ. of Science, Japan) *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 84-91 refs (For primary document see N84-24115 14-59)
(AD-P002337) Avail: NTIS HC A19/MF A01 CSCL 12/1

N84-24130# IBM Watson Research Center, Yorktown Heights, N.Y. Mathematical Sciences Dept.
A FAST COMPLEMENTATION ALGORITHM FOR SUM-OF-PRODUCTS EXPRESSIONS OF MULTIPLE-VALUED INPUT BINARY FUNCTIONS
Tsutomu Sasao *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 103-110 refs Prepared in cooperation with Osaka Univ., Japan (For primary document see N84-24115 14-59)
(AD-P002339) Avail: NTIS HC A19/MF A01 CSCL 12/1

N84-24131# Victoria Univ. (British Columbia).
THE SIMPLIFICATION OF MULTIPLE-VALUED SYMMETRIC FUNCTIONS
Jon C. Muzio, D. M. Miller (Manitoba Univ.), and G. Epstein (Indiana Univ., Bloomington) *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 111-119 refs (For primary document see N84-24115 14-59)
(AD-P002340) Avail: NTIS HC A19/MF A01 CSCL 12/1

N84-24132# Hungarian Academy of Sciences, Budapest, Computer an Automation Inst.
SELFDUAL CLASSES AND AUTOMORPHISM GROUPS
J. Demetrovics, L. Hannak, and L. Ronyai *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 122-125 refs (For primary document see N84-24115 14-59)
(AD-P002341) Avail: NTIS HC A19/MF A01 CSCL 12/1

N84-24133# Hugarian Academy of Sciences, Budapest. Computer and Automation Inst.
ON FREE SPECTRA OF CLONES WITH SHARPLY TRANSITIVE AUTOMORPHISM GROUPS
J. Demetrovics and L. Ronyai *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 126-128 refs (For primary document see N84-24115 14-59)
(AD-P002342) Avail: NTIS HC A19/MF A01 CSCL 12/1

N84-24134# Pontificia Univ. Catolica do Ecuador Quito (Brazil).
QUASITRANSITIVE ALGEBRAS
Lorenzo Pena *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 129-135 refs (For primary document see N84-24115 14-59)
(AD-P002343) Avail: NTIS HC A19/MF A01 CSCL 12/1

N84-24145# Nottingham Univ. (England). Dept. of Mathematics.
A GENERAL METHOD FOR THE EVALUATION OF DEGREE OF COMPLETENESS
A. Rose *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 208-213 refs (For primary document see N84-24115 14-59)
(AD-P002354) Avail: NTIS HC A19/MF A01 CSCL 12/1

N84-24146# Hiroshima Univ. (Japan). Dept. of Applied Mathematics.
THREE-VALUED LOGIC AND ITS APPLICATION TO THE QUERY LANGUAGE OF INCOMPLETE INFORMATION
A. Nakamura *In* Northwestern Univ. The 13th Intern. Symp. of Multiple-Valued Logic 1983 p 214-218 refs (For primary document see N84-24115 14-59)
(AD-P002355) Avail: NTIS HC A19/MF A01 CSCL 12/1

N84-24147# Haifa Univ. (Israel). School of Education.
TOWARDS A FORMAL MULTI-VALUED UTILITY THEORY
M. Katz *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 219-221 refs Submitted for publication (For primary document see N84-24115 14-59)
(AD-P002356) Avail: NTIS HC A19/MF A01 CSCL 12/1

N84-24148# Barcelona Univ. (Spain). Dept. de Matematiques i Estadistica.
AN APPROACH TO FUZZINESS IN THE SETTING OF LUKASIEWICZ LOGIC
E. Trillas *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 222-226 refs (For primary document see N84-24115 14-59)
(AD-P002357) Avail: NTIS HC A19/MF A01 CSCL 12/1

N84-24149# Meiji Univ., Kawasaki (Japan).
SYNTHESIS OF AXION SYSTEMS FOR THE THREE-VALUED PREDICATE LOGIC BY MEANS OF THE SPECIAL FOUR-VALUED LOGIC
M. Goto, S. Kao, and T. Ninomiya *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 228-234 refs (For primary document see N84-24115 14-59)
(AD-P002358) Avail: NTIS HC A19/MF A01 CSCL 12/1

N84-24153# Northwestern Univ., Evanston, Ill.
A QUATERNARY CELLULAR ARRAY COMPLEX NUMBER MULTIPLIER
Tich T. Dau *In its* The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 255-262 refs (For primary document see N84-24115 14-59)
(AD-P002362) Avail: NTIS HC A19/MF A01 CSCL 12/1

N84-24154# Florida State Univ., Tallahassee. Dept. of Mathematics and Computer Science.
A COMPARISON OF FUZZY SWITCHING FUNCTIONS AND MULTIPLE-VALUED SWITCHING FUNCTIONS
David R. Luginbuhl and Abraham Kandel *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 264-272 refs (For primary document see N84-24115 14-59)
(AD-P002363) Avail: NTIS HC A19/MF A01 CSCL 12/1

N84-24157# Meiji Univ., Kawasaki (Japan). Faculty of Engineering.
REGULAR TERNARY LOGIC FUNCTIONS. TERNARY LOGIC FUNCTIONS SUITABLE FOR TREATING AMBIGUITY
Masao Mukaidono *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 286-291 refs (For primary document see N84-24115 14-59)
(AD-P002366) Avail: NTIS HC A19/MF A01 CSCL 12/1

N84-24160# Poznan Technical Univ. (Poland). Regional Computer Center.
AN ALGEBRAIC METHOD FOR HAZARD ANALYSIS WITH THE MAXIMUM NUMBER OF SPIKES IN COMBINATIONAL AND SEQUENTIAL CIRCUITS

Janusz Rajski and Jerzy Tyszer *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 306-313 refs (For primary document see N84-24115 14-59)
(AD-P002369) Avail: NTIS HC A02/MF A01 CSCL 12/1

N84-24161# Chongquing Univ. (China).
FOUR-VALUED LOGIC STAR ALGORITHM AND THEIR APPLICATIONS
Ting-huai Chen, You-guang Yuan, Zhi-mo Liu, and Shi-min Chang *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 314-325 refs (For primary document see N84-24115 14-59)
(AD-P002370) Avail: NTIS HC A02/MF A01 CSCL 12/1

N84-24162# Department of Defense, Washington, D. C.
Mx, A MIX-VALUED ALGEBRA
Michael Sinutko, Jr. and James H. Pugsley (Maryland Univ., College Park) *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 328-336 refs (For primary document see N84-24115 14-64)
(AD-P002371) Avail: NTIS HC A19/MF A01 CSCL 12/1

N84-24163# Lockheed Missiles and Space Co., Sunnyvale, Calif.
A MINIMIZATION METHOD FOR ENGINEERING ESTIMATION
Suchitra Dhar *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 337-341 refs (For primary document see N84-24115 14-59)
(AD-P002372) Avail: NTIS HC A19/MF A01 CSCL 12/1

N84-24164# Northwest Telecommunication Engineering Inst., Xian (China). Dept. of Information Engineering.
THE OPTIMIZATION OF GMC OVER GF(P)
Ping Dong *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 342-347 refs (For primary document see N84-24115 14-59)
(AD-P002373) Avail: NTIS HC A19/MF A01 CSCL 12/1

N84-24166# University of Western Illinois, Macomb. Dept.. of Quantitative and Information Science.
ON SYSTEM DIAGNOSIS WITH MULTIVALUED TEST OUTCOMES
A. Sen Gupta and A. Sen (Indian Statistical Inst., Calcutta) *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 356-360 refs (For primary document see N84-24115 14-59)
(AD-P002375) Avail: NTIS HC A02/MF A01 CSCL 12/1

N84-24167# Poznan Technical Univ. (Poland). Regional Computer Center.
A METHOD OF TEST GENERATION FOR VERIFICATION OF WIRING CORRECTNESS
Krzysztof Bucholc *In* Northwestern Univ. The 13th Intern. Symp. on Multiple-Valued Logic 1983 p 361-364 refs (For primary document see N84-24115 14-59)
(AD-P002376) Avail: NTIS HC A19/MF A01 CSCL 12/1

N84-24174# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Mathematical Sciences.
ASYMPTOTICS AND NUMERICS
J. D. Cole *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 1-26 Prepared in cooperation with Minnesota Univ., Minneapolis (For primary document see N84-24173 14-59)
(AD-P002934) Avail: NTIS HC A99/MF A01 CSCL 12/1

N84-24180*# Wisconsin Univ., Madison. Mathematics Research Center.
APPLICATION OF SYMBOLIC COMPUTATION TO THE ANALYSIS OF MECHANICAL SYSTEMS, INCLUDING ROBOT ARMS
M. A. Hussain and B. Noble *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 143-166 Prepared in cooperation with General Electric Co., Syracuse, N.Y. (For primary document see N84-24173 14-59)
(Grant NsG-1323; Contracts ET-78-C-02-4687; N00014-77-C-0641)
(AD-P002940) Avail: NTIS HC A99/MF A01 CSCL 12A

N84-24182# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
ON THE EXTREMUM OF BILINEAR FUNCTIONAL FOR HYPERBOLIC TYPE P.D.E.
C. N. Shen *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 211-236 (For primary document see N84-24173 14-59)
(AD-P002942) Avail: NTIS HC A99/MF A01 CSCL 12/1

N84-24184# New York Univ., New York. Inst. of Mathematical Sciences.
THE COUPLING OF TRACKED AND INTERIOR WAVES IN A FRONT TRACKING SCHEME
J. Glimm, O. McBryan, B. Plohr, and S. Yaniv *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 245-253 (For primary document see N84-24173 14-59)
(Contract DAAG29-83-K-0007; Grant NSF MCS-82-07965)
(AD-P002944) Avail: NTIS HC A99/MF A01 CSCL 12/1

N84-24188# Georgia Inst. of Tech., Atlanta. School of Mathematics.
ANALYSIS OF THE VON KARMAN EQUATIONS BY GROUP METHODS
K. A. Ames and W. F. Ames *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 289-299 Prepared in cooperation with Iowa State Univ., Ames (For primary document see N84-24173 14-59)
(Contract DAAG29-81-K-0042)
(AD-P002948) Avail: NTIS HC A99/MF A01 CSCL 12/1

N84-24190# Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Ballistic Research Lab.
NON-LINEAR MULTIDIMENSIONAL MODELS, LEAST SQUARES AND REDUCED RESIDUALS
A. Celmins *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 405-430 (For primary document see N84-24173 14-59)
(AD-P002950) Avail: NTIS HC A99/MF A01 CSCL 12/1

N84-24191# White Sands Missile Range, N.Mex.
APPLICATION OF THE PRINCIPAL COMPONENT METHOD TO TRAJECTORY ESTIMATION
W. S. Agee and R. H. Turner *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 431-441 (For primary document see N84-24173 14-59)
(AD-P002951) Avail: NTIS HC A99/MF A01 CSCL 12/1

N84-24192# IBM Federal Systems Div., Owego, N. Y.
OPTIMAL REDUCED ORDER CONTROLLERS FOR DISCRETE-TIME LINEAR SYSTEMS WITH PARTIAL STATE ESTIMATION
M. F. Hutton *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 443-454 (For primary document see N84-24173 14-59)
(AD-P002952) Avail: NTIS HC A99/MF A01 CSCL 12/1

N84-24194# North Carolina State Univ., Raleigh.
ORTHOGONAL SCHEMES FOR STRUCTURAL OPTIMIZATION
M. W. Berry, M. T. Heath, R. J. Plemmons, and R. C. Ward *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 477-485 Prepared in cooperation with Union Carbide Corp., Greenville, S.C. and ORNL, Tenn. (For primary document see N84-24173 14-59)
(Contracts DAAG29-81-K-0132; W-7405-eng-26; Grant AF-AFOSR-0255-83)
(AD-P002954) Avail: NTIS HC A99/MF A01 CSCL 12/1

N84-24198# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
A FINITE INTEGRAL TRANSFORM (FIT) METHOD FOR DIF-

FERENTIAL EQUATIONS HAVING ASYMPTOTIC SOLUTIONS
C. J. Daly *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 551-558 (For primary document see N84-24173 14-59)
(AD-P002958) Avail: NTIS HC A99/MF A01 CSCL 12/1

N84-24199# Army Armament Research and Development Command, Dover, N. J. Fire Control and Small Caliber Weapon Systems Lab.
A FINITE DIFFERENCE METHOD FOR ANY PARTIAL DIFFERENTIAL EQUATION
R. Yalamanchili *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 559-566 (For primary document see N84-24173 14-59)
(AD-P002959) Avail: NTIS HC A99/MF A01 CSCL 12/1

N84-24215# Texas A&M Univ., College Station.
BIVARIATE QUADRATIC SPLINES ON CRISSCROSS TRIANGULATIONS
C. K. Chui *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 877-882 (For primary document see N84-24173 14-59)
(AD-P002979) Avail: NTIS HC A99/MF A01 CSCL 12/1

N84-24216*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPECTRAL METHODS FOR PARTIAL DIFFERENTIAL EQUATIONS
M. Y. Hussaini, C. L. Streett, and T. A. Zang *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 883-925 (For primary document see N84-24173 14-59)
(AD-P002980) Avail: NTIS HC A99/MF A01 CSCL 12A

N84-24399# Heriott-Watt Univ., Edinburgh (Scotland). Dept. of Physics.
MULTI-PARAMETER UNIVERSAL ROUTE TO CHAOS IN A FABRY-PEROT RESONATOR
E. Abraham and W. J. Firth *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 12/1

N84-24450# Academy of Sciences of the Ukrainian SSR, Kiev (USSR). Inst. of Physics.
OPTICAL BISTABILITY AND HYSTERESIS UNDER PHASE CONJUGATION IN CdS CRYSTAL Abstract Only
M. S. Brodin, A. A. Borshch, V. I. Volkov, and N. V. Kukhtarev *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 12/1

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N84-24308# Wisconsin Univ., Madison. Mathematics Research Center.
BIAS IN NONLINEAR REGRESSION Technical Summary Report
R. D. Cook, C. L. Tsai, and B. C. Wei Feb. 1984 31 p
(Contract DAAG29-80-C-0041)
(AD-A139239; MRC-TSR-2645) Avail: NTIS HC A03/MF A01 CSCL 12/1

This document investigates the biases of the residuals and the maximum likelihood parameter estimates from standard, normal-theory nonlinear regression models. Emphasis is placed on determining the influence of individual cases on the biases and on understanding how the residual biases can affect the usefulness of standard diagnostic methods. It is shown that the various bias expressions in the literature are equivalent, that the biases in nonlinear regression can be studied usefully in the context of linear regression, and that diagnostic plots using residuals can be misleading because of substantial residual biases. For a class of partially nonlinear models, it is shown that the maximum intrinsic curvature is closely related to the residual expectations. Finally, the model associated with power transformations of single explanatory variables in linear regression is investigated in further detail and several numerical illustrations are presented.
Author (GRA)

N84-24309# Wisconsin Univ., Madison. Mathematics Research Center.
EXPERIMENTAL DESIGN: REVIEW AND COMMENT Technical Summary Report
D. M. Steinberg and W. G. Hunter Feb. 1984 88 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-82-10950)
(AD-A139268; MRC-TSR-2639) Avail: NTIS HC A05/MF A01 CSCL 12/1

This document reviews major developments in the design of experiments, offers thoughts on important directions for the future, and makes specific recommendations for experimenters and statisticians who are students and teachers of experimental design, practitioners of experimental design, and researchers jointly exploring new frontiers. Specific topics covered are optimal design, computer-aided design, robust design, response surface design, mixture design, factorial design, block design, and designs for nonlinear models. GRA

N84-24310# National Opinion Research Center, Chicago, Ill.
ESTIMATION OF LATENT GROUP EFFECTS
R. J. Mislevy Aug. 1983 32 p
(Contract N00014-83-C-0283; F63-521)
(AD-A139299; TR-2) Avail: NTIS HC A03/MF A01 CSCL 12/1

Conventional methods of multivariate normal analysis do not apply when the variables of interest are not observed directly, but must be inferred from fallible or incomplete data. For example, responses to mental test items may depend upon latent aptitude variables, which modeled in turn as functions of demographic effects in the population. A method of estimating such effects by means of marginal maximum likelihood, implemented by means of an EM algorithm, is proposed. Asymptotic standard errors, likelihood ratio tests of alternative models, and computing approximations are provided. The procedures are illustrated with data for tests from the Armed Services Vocational Aptitude Battery administered to a national probability sample of American youth. Author (GRA)

N84-24311# Wisconsin Univ., Madison. Mathematics Research Center.
RESIDUALS IN NONLINEAR REGRESSION Technical Summary Report
R. D. Cook and C. L. Tsai (NYU) Jan. 1984 27 p
(Contract DAAG29-80-C-0041)
(AD-A139309; MRC-TSR-2625) Avail: NTIS HC A03/MF A01 CSCL 12/1

The authors employ a quadratic expansion to investigate the behavior of the ordinary residuals in nonlinear regression. In particular, they derive quadratic approximations for the mean and variance of the ordinary residuals, and the covariances between the ordinary residuals and the fitted values. This investigation leads to the conclusion that the ordinary residuals can produce misleading results when used in diagnostic methods analogous to those for linear regression. Consequently, a new type of residual that overcomes many of the potential shortcomings of the ordinary residuals is suggested. Author (GRA)

N84-24312# Wisconsin Univ., Madison. Mathematics Research Center.
BOOTSTRAP INFERENCE WITH STRATIFIED SAMPLES Technical Summary Report
J. N. K. Rao and C. F. J. Wu Jan. 1984 24 p
(Contract DAAG29-80-C-0041)
(AD-A139313; MRC-TSR-2629) Avail: NTIS HC A02/MF A01 CSCL 12/1

Most sample surveys involve stratification and multi-stage clustered sampling. A recent trend in survey data analysis is

inference about nonlinear statistics from complex samples. Available methods include the linearization, jackknife and balanced half-samples. In the non-survey context, another method called the bootstrap has been shown to enjoy other desirable properties, the most important one being that it reflects the skewness inherent in the original point estimate. It is shown that a straightforward extension of the usual bootstrap provides incorrect variance estimates and misleading confidence intervals. A correct version is constructed by adjusting for a scaling problem before applying the nonlinear transformation. Several desirable theoretical properties of the proposed method are described. A detailed study in the special case of the combined ratio estimator is given.
Author (GRA)

N84-24313# Virginia Univ., Charlottesville. Dept. of Systems Engineering.
A NOTE ON MIXED EXPONENTIAL APPROXIMATIONS FOR GI/G/1 WAITING TIMES
C. M. Harris Feb. 1984 17 p
(Contract N00014-83-K-0624)
(AD-A139534; UVA/525393/SE84/101) Avail: NTIS HC A02/MF A01 CSCL 12/1

A method is offered for the effective estimation of the stationary waiting-time distribution of the GI/G/1 queue by a (possibly nonconvex) mixed exponential CDF. The approach relies on obtaining a generalized exponential mixture as an approximation for the distribution of the service times. This is done by the adaptation of a nonlinear optimization algorithm previously developed for the maximum-likelihood estimation of parameters from mixed Weibull distributions. The approach is particularly well-suited for obtaining the delay distribution beginning from raw interarrival and service-time data. Author (GRA)

N84-24314# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
HITTING PROBABILITIES OF KILLED BROWNIAN MOTION: A STUDY ON GEOMETRIC REGULARITY
Christer Borell 1983 34 p refs
(CTH-Math-1983-11; ISSN-0347-2809) Avail: NTIS HC A03/MF A01

Geometric regularity properties of V-harmonic measure, V-Newtonian potentials, V-equilibrium measure and logarithmic and Newtonian capacities are established for Brownian motion X in an n-dimensional space with hitting probabilities of killed Brownian motion (X motion Brownian with the probability exponential-integral of V and V with convex domain). These properties are related to Green functions. Results in Banach spaces are given.
Author (ESA)

N84-23587# Societe Nationale Industrielle Aerospatiale, Toulouse (France). Div. Avions.
THE 310 AIRBUS TEST IN THE ONERA WIND TUNNEL: FLIGHT-WIND TUNNEL COMPARISON [AIRBUS A310 ESSAIS DANS LA SOUFFLERIE F1 DE L'ONERA COMPARAISON VOL-SOUFFLERIE]
M. Saiz and C. Quemard (ONERA, Paris) *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 23 p refs In FRENCH; ENGLISH summary (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

No abstracts in this category.

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N84-24315# Wisconsin Univ., Madison. Mathematics Research Center.
BIFURCATION AND MULTIPLICITY RESULTS FOR NONLINEAR ELLIPTIC PROBLEMS INVOLVING CRITICAL SOBOLEV EXPONENTS Technical Summary Report
G. Cerami, D. Fortunato, and M. Struwe Jan. 1984 19 p
(Contract DAAG29-80-C-0041)
(AD-A139332; MRC-TSR-2630) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper deals with the problem of existence of nontrivial solutions for a nonlinear elliptic boundary value problem in which the nonlinear term involves the critical Sobolev exponent, which is associated with a loss of compactness. The motivation for investigating this type of problem comes from the fact that mathematical models of some interesting problems in geometry (Yamabe's problem) and in physics (existence of nonminimal solutions for Yang-Mills functionals) have this character and involve a lack of compactness. Variational arguments are used here to prove some bifurcation and multiplicity results for these problems.
GRA

N84-24316# Yale Univ., New Haven, Conn. Dept. of Computer Science.
PRECONDITIONING BY FAST DIRECT METHODS FOR NON-SELF-ADJOINT NONSEPARABLE ELLIPTIC EQUATIONS
H. C. Elman and M. H. Schultz Dec. 1983 21 p
(Contract N00014-82-K-0184)
(AD-A139360; YALEU/DCS/TR-287) Avail: NTIS HC A02/MF A01 CSCL 12/1

We consider the use of fast direct methods as preconditioners for iterative methods for computing the numerical solution of non-self-adjoint elliptic boundary value problems. We derive bounds on convergence rates that are independent of discretization mesh size. For two-dimensional problems on rectangular domains, discretized on an nxn grid, these bounds lead to asymptotic operation counts of O(n squared log n 1/log epsilon) to achieve relative error epsilon and O(n squared (log n) squared) to reach truncation error.
GRA

N84-24317# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
VECTOR OPTIMIZATION TECHNIQUES
A. R. DeWispelare Sep. 1983 42 p
(AD-A139497; AFIT-EN-TR-83-5) Avail: NTIS HC A03/MF A01 CSCL 12/1

Multiple Objective Optimization Theory (MOOT) techniques are receiving increasing attention due to their ability to incorporate salient non-commensurate and conflicting objectives of an analysis or design situation into the choice making process. A common implementation of MOOT is by way of a vector optimization process. Vector Optimization is used for generating optimum solutions for alternatives which extremize the components of vectors of objective functions or performance indices. The weighting and constraint techniques are presented as ways of practically implementing an optimization process for vectors of cost functions to generate a Pareto optimal or non-dominated solution set. Computer programs are discussed which accomplish the vectors optimization process for the parameter optimization class of linear problems (MOOTLP) and non-linear problems (PROCES). A bibliographic summary of recent vector optimization efforts is included. Author (GRA)

N84-24318# Sheffield Univ. (England). Dept. of Control Engineering.
ON THE GENERATION OF INFINITE DIMENSIONAL BILINEAR SYSTEMS AND VOLTERRA SERIES
S. P. Banks Jun. 1983 24 p refs
(RR-228) Avail: NTIS HC A02/MF A01

A Hilbert space of the bilinearization of infinite dimensional nonlinear systems is constructed and the Volterra series on little l

square integrable space are considered. Takata's ideas are generalized to infinite dimensional systems. A Hilbert space of square integrables big L with relation to scalar weighting function w is constructed with a typical basis expressed in terms of Hermitian polynomial. Author (ESA)

N84-24319# Fondazione Ugo Bordoni, Rome (Italy).
AN EFFICIENT METHOD FOR THE CONVERSION TO RESIDUE NUMBER SYSTEMS AND ITS APPLICATION TO CONVOLUTIONS
Giuseppe Martinelli (Rome Univ.), Gianni Orlandi (Rome Univ.), and Mario Salerno (Rome Univ.) Dec. 1982 10 p ref
(FUB-53-1982) Avail: NTIS HC A02/MF A01

Chinese remainder theorem and a general expression involving any combination of sums and product of m integers among them in terms of the residual class module M of the general expression of each number on the residual module M are considered. Digital circuit methods for the conversion of the residual number system to conduction of sequences are applied. Author (ESA)

N84-24185# California Univ., Los Angeles. Dept. of Mathematics.
RIEMANN SOLVERS, THE ENTROPY CONDITION AND HIGH RESOLUTION DIFFERENCE APPROXIMATIONS
S. Osher *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 255-257 (For primary document see N84-24173 14-59)
(Grant DAAG29-82-G-0090)
(AD-P002945) Avail: NTIS HC A99/MF A01 CSCL 12/1

N84-24214# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
EXPLICIT FORMULAS FOR C TO THE nTH POWER PIECEWISE HERMITE BASIS FUNCTIONS
R.W.. Jr. Soanes *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 871-876 (For primary document see N84-24173 14-59)
(AD-P002978) Avail: NTIS HC A99/MF A01 CSCL 12/1

N84-24274# Kyoto Univ. (Japan). Research Inst. for Mathematical Sciences.
CLASSIFICATION OF NASH MANIFOLDS
Masahiro Shiota *In* Grenoble-1 Univ. Ann. of the Fourier Inst., Vol. 33, No. 3 1983 p 209-232 refs (For primary document see N84-24264 14-64)
Avail: NTIS HC A13/MF A01

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N84-24320# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STABILITY OF PERMANENT MAGNETS
A. V. Mitkevich 6 Mar. 1984 304 p Transl. into ENGLISH of the mono. "Stabilnost Postoyannykh Magnitov" Leningrad, Energiya, 1971 p 1-128
(AD-A139471; FTD-ID(RS)T-1344-83) Avail: NTIS HC A14/MF A01 CSCL 20/3

The stability of permanent magnets and magnetic systems in time and with a change in temperature was investigated. The effects of impacts, vibrations, and external fields were examined. New accelerated methods were proposed to study the stability of magnets and magnetic systems. Author

N84-24321# Mound Lab., Miamisburg, Ohio.
PERIODS FOUND IN HEAT MEASUREMENTS OBTAINED BY CALORIMETRY
K. C. Jordan 28 Feb. 1984 19 p refs
(Contract DE-AC04-76DP-00053)
(DE84-007446; MLM-3108) Avail: NTIS HC A02/MF A01

During a span of 640 days, a periodicity of 1.5158 + or - 0.0008 days was discovered in successive heater equilibria on Calorimeter No. 127. Measurements were taken at 12-h intervals, with occasional changes of exactly 3 or 6 h in the schedule of measurements. This schedule eliminated all other possible periods except a period of 0.150156 days. Periods of 1.519125 and 1.511283 days were discovered in data on the excess length of day as obtained by the US Naval Observatory over a period of 24 y. These two periods could equally well represent periods of 0.150189 and 0.150112 days since measurements were obtained only once every 24 h. Periods observed in sensitive calorimeters and in length of day data are related. DOE

N84-24322# National Bureau of Standards, Washington, D.C.
JOURNAL OF RESEARCH OF THE NATIONAL BUREAU OF STANDARDS. VOLUME 88, NUMBER 6, NOVEMBER-DECEMBER 1983 Bimonthly Progress Report
Dec. 1983 61 p refs
(PB84-160605; LC-63-37059) Avail: NTIS HC A04/MF A01 CSCL 14B

Topics included are: a polystyrene water calorimeter; applicability of the Colebrook-White formula to represent frictional losses in partially filled unsteady pipeflow; circulants and the characterization of vertex-transitive graphs; and on the decomposition of vertex-transitive graphs into multicycles. GRA

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution*.

N84-24323*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
EXPERIMENTAL INVESTIGATION OF SHOCK-CELL NOISE REDUCTION FOR DUAL-STREAM NOZZLES IN SIMULATED FLIGHT COMPREHENSIVE DATA REPORT. VOLUME 1: TEST NOZZLES AND ACOUSTIC DATA
K. Yamamoto, B. A. Janardan, J. F. Brausch, D. J. Hoerst, and A. O. Price Feb. 1984 533 p 2 Vol.
(Contract NAS3-23166)
(NASA-CR-168336; NAS 1.26:168336; R83AEB358-Vol-1) Avail: NTIS HC A23/MF A01 CSCL 20A

Parameters which contribute to supersonic jet shock noise were investigated for the purpose of determining means to reduce such noise generation to acceptable levels. Six dual-stream test nozzles with varying flow passage and plug closure designs were evaluated under simulated flight conditions in an anechoic chamber. All nozzles had combined convergent-divergent or convergent flow passages. Acoustic behavior as a function of nozzle flow passage geometry was measured. The acoustic data consist primarily of 1/3 octave band sound pressure levels and overall sound pressure levels. Detailed schematics and geometric characteristics of the six scale model nozzle configurations and acoustic test point definitions are presented. Tabulation of aerodynamic test conditions and a computer listing of the measured acoustic data are displayed. R.S.F.

N84-24324*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
EXPERIMENTAL INVESTIGATION OF SHOCK-CELL NOISE REDUCTION FOR DUAL-STREAM NOZZLES IN SIMULATED FLIGHT COMPREHENSIVE DATA REPORT. VOLUME 2: LASER VELOCIMETER DATA, STATIC PRESSURES AND SHADOWGRAPH PHOTOS
K. Yamamoto, B. A. Janardan, J. F. Brausch, D. J. Hoerst, and A. O. Price Feb. 1984 525 p 2 Vol.
(Contract NAS3-23166)
(NASA-CR-168336; NAS 1.26:168336; R83AEB358-Vol-2) Avail: NTIS HC A22/MF A01 CSCL 20A

Parameters which contribute to supersonic jet shock noise

were investigated for the purpose of determining means to reduce such noise generation to acceptable levels. Six dual-stream test nozzles with varying flow passage and plug closure designs were evaluated under simulated flight conditions in an anechoic chamber. All nozzles had combined convergent-divergent or convergent flow passages. Mean velocity and turbulence velocity measurements of 25 selected flow conditions were performed employing a laser Doppler velocimeter. Static pressure measurements were made to define the actual convergence-divergence condition. Test point definition, tabulation of aerodynamic test conditions, velocity histograms, and shadowgraph photographs are presented. Flow visualization through shadowgraph photography can contribute to the development of an analytical prediction model for shock noise from coannular plug nozzles. R.S.F.

N84-24325*# National Aeronautics and Space Administration, Washington, D. C.
VELOCITIES OF GUIDED ULTRASONIC WAVES IN HETEROGENEOUS MEDIUM
Maurice Touratier Apr. 1984 12 p refs Transl. into ENGLISH from Compt. Rend., Ser. 2, Mech., Phys., Chim. Sci. de l'Univers Sci. de la Terre (France), v. 296, no. 14, 18 Apr. 1983 p 1039-1042 Original language document was announced as A83-38067 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77445; NAS 1.15:77445) Avail: NTIS HC A02/MF A01 CSCL 20A

Experimental and theoretical examinations were performed of the longitudinal velocity characteristics of waves in trilaminar and encapsulated waveguides. The study was confined to waveguides with core material that featured transverse wave velocities much worse than the longitudinal wave velocities. The velocities were obtained using a dispersion equation, with consideration given to both the core and encapsulant. Asymptotic velocities were also calculated for bending and twisting in trilaminar waveguides. Trials were run with bimetallic waveguides for comparison with the theoretical predictions. Good agreement was found between the predicted velocity of the propagation of the fundamental mode and the measured velocities. The method was calculated valid for modes above four, confirming that the data were contained in either the core or outer layer, and were unsensitive to the encapsulant. Author

N84-24326*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ACOUSTIC-OPTIC SPECTROMETER. 1: NOISE CONTRIBUTIONS AND SYSTEM CONSIDERATION
Gordon Chin Apr. 1984 44 p refs
(NASA-TM-85613; X-693-84-9; NAS 1.15:85613) Avail: NTIS HC A03/MF A01 CSCL 20A

An acousto-optic spectrometer (AOS) used as an IF spectrometer to a heterodyne receiver is modeled as a total power multichannel integrating receiver. Systematic noise contributions common to all total power, time integrating receivers, as well as noise terms unique to the use of optical elements and photodetectors in an AOS are identified and discussed. In addition, degradation of signal-to-noise ratio of an unbalanced Dicke receiver compared to a balanced Dicke receiver is found to be due to gain calibration processing and is not an instrumental effect. Author

N84-24327*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ACOUSTIC MEASUREMENTS OF A FULL-SCALE ROTOR WITH FOUR TIP SHAPES. VOLUME 1: TEXT, APPENDICES A AND B
Marianne Mosher Apr. 1984 90 p refs
(NASA-TM-85878-Vol-1; A-9602-Vol-1; NAS 1.15:85878-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 20A

A full-scale helicopter with four different blade-tip geometries was tested in the 40- by 80-foot wind tunnel at Ames Research Center. Performance, loads, and noise were measured. The four tip shapes tested were rectangular, tapered, swept, and swept-tapered. Noise measurements from that test are presented in the form of tables and plots. The noise data include measurements of the sound pressure level in dB, dBA, and tone-corrected PNdB, for all of the conditions tested. Detailed measurements, 1/3-octave spectra and time-histories for some selected data are included as well as plots of dBA as function of test condition. Some performance measurements are given to aid interpretation of the noise data. Author

N84-24328# Army Field Artillery School, Fort Sill, Okla.
NOISE, A BIBLIOGRAPHY Final Report
L. L Miller, Jr. 1 Mar. 1984 7 p
(AD-A138896; USAFAS/MSLD/SB105) Avail: NTIS HC A02/MF A01 CSCL 20/1

Noise is the subject of this bibliography which has been developed from the military point-of-view. Operationally it may be defined as sound which lacks musical quality due to its discordant harmonic features. Selection of material coverage has been drawn from the unclassified book, document, and military periodicals holdings of the Morris Swet Technical Library, USAFAS. Inclusion of an item, or omission, neither implies USAFAS indorsement or sanction of the compiler's approach. GRA

N84-24329# Technische Hochschule, Darmstadt (West Germany).
FLIGHT SIMULATION INVESTIGATIONS FOR THE PROBLEM OF FLYABILITY OF NOISE OPTIMAL APPROACH AND TAKEOFF PATHS Final Report [FLUGSIMULATIONSUNTERSUCHUNGEN ZUR FRAGE DER FLIEGBARKEIT LAERMOPTIMALER AN- UND ABFLUGBAHNEN]
Rainer Friedel 3 Oct. 1983 100 p refs In GERMAN
(Contract HA-514/59)
(IFD-3/83) Avail: NTIS HC A05/MF A01

Noise reduction during takeoff and landing of the A 300 B Airbus was studied using flight simulation. Operational aspects such as flyability and safety were emphasized. The investigations were limited to aircraft control in the vertical path plane, since the extension to the horizontal path control can only be made for a real airport and its surroundings. Noise emission parameters included noise frequency, direction and thrust dependence of propulsion system noise emission, aircraft spatial position, air damping as a function of noise frequency, air temperature and relative humidity as a function of flight height, and soil damping. The results show that reductions of the noise in the neighborhood of airports are possible, compared to the usual takeoff and landing methods (IATA steep takeoff method, low drag low power approach method). Author (ESA)

N84-23580# National Aeronautical Establishment, Ottawa (Ontario).
PREDICTION OF RESONANCE FREQUENCIES FOR VENTILATED WALL WIND TUNNELS
M. Mokry *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 10 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23583# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abt. Technische Akustik.
PROPELLER AND ROTOR NOISE TESTING IN AEROACOUSTIC WIND TUNNELS
H. H. Heller, W. R. Splettstoesser, R. F. Neubauer, F. R. Grosche, M. K. Kallergis, and K. J. Schultz *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 18 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

N84-23584# Middle East Technical Univ., Ankara (Turkey). Dept. of Mechanical Engineering.
AEROACOUSTIC NOISE MEASUREMENTS IN WIND TUNNEL
H. Nafiz Alemdaroglu *In* AGARD Wind Tunnels and Testing Tech. Feb. 1984 14 p refs (For primary document see N84-23564 14-01)
Avail: NTIS HC A22/MF A01

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N84-24330*# National Aeronautics and Space Administration, Washington, D. C.
MANIFESTATION OF THE FERMI RESONANCE IN SURFACE POLARITON SPECTRA
G. A. Puchkovskaya, V. L. Strizhevskiy, Y. A. Frolkov, N. M. Chepilko, and L. A. Krivodonova Jan. 1984 6 p refs Transl. into ENGLISH from Ukr. Fiz. Zh. (USSR), v. 25, no. 4, 1980 p 691-692 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77386; NAS 1.15:77386) Copyright. Avail: NTIS HC A02/MF A01 CSCL 20H

The method of disturbed full internal reflection (DFIR) is used to detect and interpret the resonance splitting of the surface polariton. The effect in the spectra of oscillatory SP which are reflected by the DFIR method in Otto geometry was experimentally recorded. It is concluded that the resonance splitting of the dispersion branch of SP may serve as an effective method for detecting weak oscillations and for measuring their parameters. Author

N84-24331# Toronto Univ. (Ontario). Inst. of Aerospace Studies.
LATERAL DISPERSION OF A HIGH-ENERGY ION BEAM IN A SCATTERING MEDIUM
T. W. Crouch and J. J. Gottlieb Apr. 1984 134 p refs Sponsored in part by the Natural Sciences and Engineering Research Council of Canada
(UTIAS-278; ISSN-0082-5255) Avail: NTIS HC A07/MF A01

The problem of the lateral dispersion of a beam of high energy ions by molecular collisions as it passes through a variable density medium is solved by using both a Monte Carlo simulation and a new approximate analytical method. Numerous Monte Carlo computer runs are completed for high energy iorrs (protons) moving in a varying density gas (molecular hydrogen). These runs include aphysical cases for which the energy of the ion is unattenuated with distance and physical cases for which the ion energy is decreased in accordance with experimental measurements of its range. Such numerical results show clearly that the beam-dispersion profiles at increasing ion beam penetration depths are essentially self similar and that the profiles from different cases were also essentially similar. Based on the idea of similarity, an approximate analytical method is developed for quick and easy scaling of the beam-dispersion profiles within each case and from one case to another, in order to dispense with the time consuming and costly Monte Carlo simulations. Author

N84-24332# Naval Research Lab., Washington, D. C.
NUMERICAL AND ANALYTICAL STUDIES OF BEAM CHANNEL TRACKING Memorandum Report, 1 Oct. 1982 - 1 Oct. 1983
B. Hui and M. Lampe 29 Feb. 1984 43 p
(ARPA Order 4395)
(AD-A139148; AD-E301345; NRL-MR-5136) Avail: NTIS HC A03/MF A01 CSCL 12/1

The interaction force between a rigidly displaced relativistic electron beam and a performed channel is analyzed. The displacement is not assumed to be small. It is found that two types of equilibria can exist, either on axis with respect to the channel or displaced from the channel by a prescribed amount. The location of the equilibrium depends on the ratio of beams radius to channel radius and the types of channels. Author (GRA)

N84-24333# National Academy of Sciences - National Research Council, Washington, D. C. Committee on Line Spectra of the Elements-atomic Spectroscopy.
CURRENT TRENDS IN ATOMIC SPECTROSCOPY. REPORT ON A WORKSHOP HELD IN TUCSON, ARIZONA, OCTOBER 24-26, 1982 Final Report, 1 May 1982 - 31 May 1983
C. K. Reed 1984 93 p Original contains color illustrations
(Grant AF-AFOSR-0172-82; AF Proj. 2301)
(AD-A139288; AFOSR-84-0162TR) Avail: NTIS HC A05/MF A01 CSCL 07/4

This report expresses the collective opinion of the workshop participants that the areas covered are representative of the best work going on in atomic spectroscopy. In discussing current trends and future goals for research, we have tried to share with the reader our appraisal of where the field is and where it is going. This report has been prepared with the intention that it be an aid to funding agencies in assessing research proposals and to management at research institutions in guiding research carried out in their facilities. Author (GRA)

N84-24334# Indiana Univ., Bloomington. Dept. of Chemistry.
A DETAILED CONSIDERATION OF RESONANCE RADIATION TRAPPING IN THE ARGON INDUCTIVELY COUPLED PLASMA Interim Technical Report
J. W. Mills and G. M. Hieftje 9 Mar. 1984 28 p
(Contract N00014-76-C-0838)
(AD-A139369; INDU/DC/GMH/TR-84-61; TR-70) Avail: NTIS HC A03/MF A01 CSCL 07/4

The extent and duration of trapping of argon resonance radiation (106.7 nm and 104.8 nm) in the ICP was calculated using a model incorporating line shape contributions from both Doppler and pressure broadening. The trap was found to be at the pressure-broadened limit, giving an escape factor of .00079 when excitation of the 4s states in the plasma annulus is assumed. Theoretical apparent radiative lifetimes tau sub app for argon 3P1 and 1P1 resonance states are calculated to be 8 microseconds and 1.9 microseconds respectively. The quartet of 4s states, rapidly mixed by electron collisions, are presumed to share an overall apparent radiative lifetime tau sub app = 1.6 microseconds for the purpose of plasma modeling. Effects of this radiation trapping on the argon 4s atom density and on electron-ion recombination are discussed. Author (GRA)

N84-24335# City Univ. of New York, N. Y.
[RESEARCH IN THE AREA OF LASER MODIFIED ATOMIC PHYSICS]
M. H. Mittleman Jan. 1983 13 p
(Contract N00014-76-C-0014)
(AD-A139387) Avail: NTIS HC A02/MF A01 CSCL 20/8

This document describes research mainly in the area of laser modified atomic physics with additional work on relativistic effects in heavy atoms. GRA

N84-24336# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
LINEAR INDUCTION ACCELERATOR
V. S. Bosamykin and A. I. Pavlovskiy 5 Mar. 1984 6 p Transl. into ENGLISH from Russian Patent 270913 (4 Nov. 1971) p 1-2
(AD-A139458; FTD-ID(RS)T-1821-83) Avail: NTIS HC A02/MF A01 CSCL 20/7

A linear induction accelerator of charged particles, containing inductors and an acceleration circuit, characterized by the fact that, for the purpose of increasing the power of the accelerator, each inductor is made in the form of a toroidal line with distributed parameters, from one end of which in the gap of the line a ring commutator is included, and from the other end of the ine a resistor is hooked up, is described. R.J.F.

N84-24337# Smithsonian Astrophysical Observatory, Cambridge, Mass.
MEASUREMENTS OF IONIZATION BALANCE PARAMETERS IN ATOMIC IONS Progress Report, 1 Jan. - 31 Dec. 1983
John L. Kohl Jan. 1984 8 p
(Contract DE-AC02-80ER-10631)
(DE84-007884; DOE/ER-10631/4) Avail: NTIS HC A02/MF A01

Significant progress was made toward the measurement of the cross section for dielectronic recombination of C(3+) and a free electron. The instrumentation required to disperse and detect recombined ions was added to the apparatus, and initial measurements indicate that the present background C(2+) detecting rate

is within a factor of 5 of being acceptable. By improving the vacuum in the beam transport system, an attempt was made to reduce the background. A pressure of 5x10(-9) torr in this region provides a real to accidental coincidence ratio of 0.074 and a meaningful measurement of dielectronic recombination in 4.5 hours. DOE

N84-24338# Syracuse Univ., N. Y. Dept. of Physics.
RESEARCH PROGRAM IN ELEMENTARY PARTICLE THEORY Progress Report, period ending 30 Jun. 1984
1984 48 p refs
(Contract DE-AC02-76ER-03533)
(DE84-006867; DOE/ER-03533/T2) Avail: NTIS HC A03/MF A01

The Syracuse High Energy Theory group has made significant contributions to many areas of current research. Progress is described. Properties of the magnetic superconductor model fo the QCD vacuum were studied. A model was constructed for an accurate description of proton decay in Grand Unified Models. The Kobayashi Maskawa mixing matrix and its implications for phenomenology were studied under the hypothesis that the Peccei-Quinn symmetry is a flavor symmetry. Chiral Lagrangians were investigated later in the usual and nontrivial topological sectors. Symmetry breakdowns induced by monopoles and its implications were studied in detail. A number of puzzling features associated with the Rubakov effect were clarified. An analysis of experimental constraints on heavy neutrino masses was carried out. The consequences of nontrivial topologies in Einstein's gravity and Polyakov's string model were studied. Effective Lagrangians for supesymmetric gauge theories were investigated. A book on gauge symmetries and fiber bundles was published. DOE

N84-24339# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
INNER-SHELL PHOTOEMISSION FROM ATOMS AND MOLECULES USING SYNCHROTRON RADIATION Ph.D. Thesis
D. W. Lindle Dec. 1983 133 p refs Sponsored in part by NSF
(Contract DE-AC03-76SF-00098)
(DE84-006624; LBL-16864) Avail: NTIS HC A07/MF A01

Photoelectron spectroscopy, in conjunction with synchrotron radiation, was used to study inner shell photoemission from atoms and molecules. The time structure of the synchrotron radiation permits the measurements of time of flight (TOF) spectra of Auger and photoelectrons, thereby increasing the electron collection efficiency. The double angle TOF method yielded angle resolved photoelectron intensities, which were used to determine photoionization cross sections and photoelectron angular distributions in several cases. Comparison to theoretical calculations was made where possible to help explain observed phenomena in terms of the electronic structure and photoionization dynamics of the systems studied. DOE

N84-24340# Brookhaven National Lab., Upton, N. Y. Accelerator Dept.
IONIZATION OF POLARIZED HYDROGEN ATOMS
James G. Alessi 1983 14 p refs Presented at the 3rd Intern. Symp. on the Production and Neutralization of Negative Ions and Beams, Upton, N.Y., 14-18 Nov. 1983
(Contract DE-AC02-76CH-00016)
(DE84-007378; BNL-34235; CONF-831180-23) Avail: NTIS HC A02/MF A01

Methods are discussed for the production of polarized H(-) ions from polarized atoms produced in ground state atomic beam sources. Present day sources use ionizers of two basic types - electron ionizers for H(+) Vector production followed by double charge exchange in a vapor, or direct H(-) Vector production by charge exchange of H(0) with Cs(0). Both methods have ionization efficiencies of less than 0.5%. Ionization efficiencies in excess of 10% may be obtained in the future by the use of a plasma ionizer plus charge exchange in Cs or Sr vapor, or ionization by resonant charge exchange with a self extracted D(-) beam from a ring magnetron or HCD source. Author

N84-24341# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
REGULAR AND STOCHASTIC MOTIONS OF CHARGED PARTICLES IN ELECTROSTATIC WAVES [REGULAERE UND STOCHASTISCHE BEWEGUNGEN SELADENER TEILCHEN IN ELEKTROSTATISCHEN WELLEN]
Joerg Mayer-Stoehr Mar. 1983 98 p refs In GERMAN
(IPF-83-7) Avail: NTIS HC A05MF A01

Electron motion in electrostatic waves was investigated, especially the transition from regular to irregular trajectories. Nonlinear equations of motion were solved; the real time phase trajectory was plotted; and the results were represented as mappings (surface of section plots). The velocity evolution was numerically Fourier transformed and the comcomitant power density spectrum given. An amplitude modulated wave was investigated. Nonlinear resonances occur, leading to chaotic behavior. In the case of a standing electrostatic wave, ponderomotive potentials are found. For increasing wave amplitudes these potentials disappear and the phase space is mainly stochastic. This transition is shown by mappings and velocity spectra. For a particle in an amplitude modulated standing wave, ponderomotive potentials occur. For increasing amplitudes more and more particles are captured in domains of nonlinear resonance. For increasing modulation the particles behave chaotically and the ponderative potentials disappear. Author (ESA)

N84-24342# National Bureau of Standards, Washington, D.C. Center for Radiation Research.
PIECE-WISE ANALYTIC EVALUATION OF THE RADIATIVE TAIL FROM ELASTIC AND INELASTIC ELECTRON SCATTERING
Leonard C. Maximon and Steven E. Williamson (Illinois Univ.) Dec. 1983 108 p refs
(Grant NSF PHY-80-23603)
(PB84-155290; NBSIR-83-2788) Avail: NTIS HC A06/MF A01 CSCL 20H

The calculation of the radiative tail from the elastic peak in medium and high energy electron scattering as well as from a discrete inelastic level of the recoiling nucleus is discussed. The method generally used for this calculation, viz., a numerical integration of the differential cross section over the angles of the unobserved photon is examined and the difficulties inherent in this numerical integration due to the sharp peaking of the integrand are discussed. An alternative method for calculating the radiative tail; in which the region of integration is divided into an arbitrary number of subintervals, the structure functions are fitted by cubic spline functions in each subinterval, and the integrations are then performed analytically in closed form are presented. This method has the advantages of greatly increased accuracy and a reduction of the computation time by a factor which can vary between 10 and 1000, depending on the kinematics. GRA

N84-23689# Chemical Dynamics Corp., Columbus, Ohio.
THEORETICAL PREDICTIONS OF EXCITATION CROSS SECTIONS FOR COLLISIONS OF HF, HCl, CO, H/SUB 2O, AND CO/SUB 2 WITH O(SUP 3P)
M. J. Redmon, B. C. Garrett, and L. T. Redmon *In* APL The 14th JANNAF Plume Technol. Meeting, Vol. 1 1983 p 123-129 refs (For primary document see N84-23678 14-20)
(Contract F04611-82-C-0041)
Avail: NTIS HC A07/MF A01 CSCL 20/8

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N84-24343# Hanford Engineering Development Lab., Richland, Wash.
FUEL SYSTEMS FOR COMPACT FAST SPACE REACTORS

C. M. Cox, D. S. Dutt, and R. A. Karnesky Dec. 1983 23 p refs Presented at Symp. on Space Nucl. Power Systems, Albuquerque, N. Mex., 10 Jan. 1984
(Contract DE-AC06-76FF-02170)
(DE84-006545; HEDL-SA-3065-FP) Avail: NTIS HC A02/MF A01

About 200 refractory metal clad ceramic fuel pins were irradiated in thermal reactors under the 1200 K to 1550 K cladding temperature conditions of primary relevance to space reactors. Performance with respect to fissile atom density, operating temperatures, fuel swelling, fission gas release, fuel-cladding compatibility, and consequences of failure is reviewed. It was concluded that UO2 and UN fuels show approximately equal performance potential and that UC fuel has lesser potential. The W/Re alloys performed quite well as cladding materials, and Ta, Nb, and Mo/Re alloys, in conjunction with W diffusion barriers, show good promise. DOE

N84-24344# Los Alamos Scientific Lab., N. Mex.
SPACE NUCLEAR SAFETY PROGRAM, SEPTEMBER 1983 Progress Report
S. E. Bronisz, comp. Jan. 1984 11 p
(Contract W-7405-eng-36)
(DE84-007989; LA-10000-PR) Avail: NTIS HC A02/MF A01

This technical monthly report covers studies related to the use of (238) PuO2 in radioisotope power systems carried out for the Office of Special Nuclear Projects of the US Department of Energy by Los Alamos National Laboratory. Most of the studies discussed here are ongoing. Results and conclusions described may change as the work continues. DOE

N84-24345# California Univ., Berkeley. Lawrence Berkeley Lab. Nuclear Science Div.
NUCLEAR MOMENTS OF INERTIA AT HIGH SPINS
M. A. Deleplanque Dec. 1983 15 p refs Presented at the Workshop on Collective States in Nuclei, Suzhou, China, 8-18 Sep. 1983
(Contract DE-AC03-76SF-00098)
(DE84-005717; LBL-17082; CONF-8309205-1) Avail: NTIS HC A02/MF A01

Nuclei with highest angular momentum are discussed. The production of high spin states, and the basic ideas associated with high spin physics are reviewed. Recent developments from continuum gamma-ray studies are presented: the measurement of different average moments of inertia gives new information on the interplay between collective and single particle aspects at high spins. Finally, the possibility of resolving the continuum spectra with new detector systems is examined. DOE

74 OPTICS

Includes light phenomena.

N84-24346*# National Aeronautics and Space Administration, Washington, D. C.
FIBER OPTIC SENSORS
Joachim Hesse and W. Sohler May 1984 15 p refs Transl. into ENGLISH from Elektronik (Denmark), v. 31, no. 12, 18 Jun. 1982 p 89-92 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77404; NAS 1.15:77404) Avail: NTIS HC A02/MF A01 CSCL 20F

A survey of the developments in the field of fiber optics sensor technology is presented along with a discussion of the advantages of optical measuring instruments as compared with electronic sensors. The two primary types of fiber optics sensors, specifically those with multiwave fibers and those with monowave fibers, are described. Examples of each major sensor type are presented and discussed. Multiwave detectors include external and internal fiber optics sensors. Among the monowave detectors are Mach-Zender interferometers, Michelson interferometers, Sagnac interferometers (optical gyroscopes), waveguide resonators, and polarimeter sensors. Integrated optical sensors and their application in spectroscopy are briefly discussed. R.S.F.

N84-24347# Naval Research Lab., Washington, D. C.
TWO METHODS FOR CALCULATING THE PHYSICAL OPTICS FIELD Memorandum Report, Oct. 1982 - Sep. 1983
W. B. Gordon 29 Feb. 1984 24 p
(RR0-2105)
(AD-A139116; NRL-MR-5289) Avail: NTIS HC A02/MF A01 CSCL 12/1

In the theory of Physical Optics the field scattered by a curved reflecting surface S is represented by an integral whose numerical evaluation is difficult. Two methods for calculating this integral are discussed: A Monte Carlo method and the method by Facet Decomposition. The first is limited by round-off error whereas the second is limited by computer storage and CPU running time. The Facet Decomposition method is exact when S is flat, and is superior to the Monte Carlo method when S is only slightly curved according to a certain criterion. Author (GRA)

N84-24348# Naval Research Lab., Washington, D. C.
OPTICAL IMAGING OF A COUPLING REGION BETWEEN INTER-STREAMING PLASMAS
J. A. Stamper, B. H. Ripin, E. A. McLean, and S. P. Obenschain 24 Feb. 1984 32 p
(AD-A139191; NRL-MR-5278) Avail: NTIS HC A03/MF A01 CSCL 20/6

Recent studies in the NRL HANE simulation experiment have been directed toward a higher pressure/low altitude regime where HANE events (e.g., Checkmate) and early HANE simulations (P > or approx. = .5 Torr) had shown a turbulence or jetting. The main diagnostic was dual-time, dark-field shadowgraphy which had sufficient temporal ()300 psec) and spatial (10 micron) resolution to resolve details of the developing structure. A well-defined, initially nearly-spherical front or coupling region is seen which slows down, indicating mass pick-up. At higher ambient pressure, lower laser energy and later time, the front shows a breakup. When conditions are just marginal for break-up, the front tends to form a single protuberance or aneurism which grows in time. Author (GRA)

N84-24349# Hughes Research Labs., Malibu, Calif.
NEW MATERIALS FOR INFRARED TRANSMITTING ELECTROOPTIC FILTERS Quarterly Report, 1 May - 31 Jul. 1978
A. L. Gentile Aug. 1978 30 p
(Contract MDA903-78-C-0180; DARPA Order 3519)
(AD-A139272; QR-2) Avail: NTIS HC A03/MF A01 CSCL 20/6

The objectives of this program are to find and develop new IR transmitting materials and to provide new data on the electro-optic (EO) properties of those most likely to have an EO coefficient an order to magnitude higher than materials currently in development for tunable filters. The main technical problems anticipated include the synthesis and single-crystal growth of these materials: many are poorly characterized and others have high melting points or melt incongruently. Our approach will overcome these obstacles by first synthesizing 20 polycrystalline samples; subsequently, dielectric constants at low and ambient temperatures will be determined and the two best materials of the survey will be grown as single crystals (second year of the program). During the last quarter, GeS2 was grown as small single-crystal sample, and evaluated. Over the range 5 kHz to 100 kHz, the dielectric constant shows little variation: 10.73 at 5 kHz, 10.52 at 100 kHz. Far infrared spectroscopy measurements in regions where the dielectric constant epsilon is essentially equal to the square of the refractive index, epsilon = n sq., are in generally good agreement with the above measurements, taking into account some of the features of the curve of epsilon as a function of frequency. GRA

N84-24350# Stanford Univ., Calif.
PHOTOACOUSTIC IMAGING Annual Report, 30 Jun. 1982 - 29 Jun. 1983

C. F. Quate Dec. 1983 38 p
(Grant AF-AFOSR-0248-82; AF Proj. 2306)
(AD-A139298; SU-GL-3672; AFOSR-84-0156TR) Avail: NTIS HC A03/MF A01 CSCL 20/6

This report includes a description of two new high frequency photoacoustic and photothermal imaging systems developed in the reporting period. Also included is a photoacoustic study of laser recrystallized silicon, and an extension to three dimensions of the theory of thermo-acoustic generation in solids.

Author (GRA)

N84-24351*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A FEASIBILITY STUDY OF THE PRODUCTION OF LOW LOSS IR FIBERS IN SPACE Final Report
M. C. Weinberg, G. F. Neilson, and M. A. Zak 15 Nov. 1983 55 p
(Contract NAS7-918; ARPA Order 4665)
(NASA-CR-173430; NAS 1.26:173430; AD-A139390) Avail: NTIS HC A04/MF A01 CSCL 20F

In this study a preliminary evaluation is made of the feasibility of preparing fluoride glass optical fibers in space. The glass processing steps are analyzed and those which may contribute to property degradation are indicated, and the possibility of successfully executing such steps in space are considered. Two critical factors are the relative cooling rates and fluid flow characteristics of the fibers, during drawing, on Earth and in space. It has been concluded that fiber cooling rates in space will be equal to or less than those on Earth. This feature is detrimental to fiber pulling in space. Also, gravity plays a small role in determining the characteristics of the fluid flow. However, at higher temperatures, where the viscosity is low, gravitational effects could be important in determining the pulling force on the fiber, and it is believed that certain flows unobtainable on Earth could be realized in space. This flow regime could potentially be utilized advantageously for the production of fluoride fibers in space. However, additional calculations and experiments are required to demonstrate the feasibility of this approach. Author (GRA)

N84-24352# Hughes Research Labs., Malibu, Calif.
A STUDY OF THE MECHANICS OF RADIATION DAMAGE IN FIBER OPTICAL WAVEGUIDES Final Report, Sep. 1980 - Dec. 1983
G. R. Blair Mar. 1984 30 p
(Contract DAAG29-80-C-0139)
(AD-A139590; ARO-16911.3-MS) Avail: NTIS HC A03/MF A01 CSCL 20/6

Ionizing radiation on optical fibers induces large transmission losses. The permanence and intensity of the damage depends on the concentration of germanium and phosphorus. The sensitive structure(s) may act as electron or hole traps when illuminated with gamma rays (1.2 meV) or ultraviolet (4.9 eV). The process of emptying traps by heat and refilling with UV (254 nm) can be done repeatedly. These traps re-populated by UV are the same as the transmission loss traps due to gammas. Certain TL traps cannot be re-populated with UV. The nonrefillable TL traps exist in those glasses which have the GeO2/P2O5 ratios smaller than 4. Higher ratio glasses exhibit one refillable peak which bears an inverse relationship to germanium content. The TL traps have a depth of about 0.85 eV. Pure silica fibers display a permanent thermoluminescence. The presence of these traps is not detected by transmission measurements. Based on UV thermoluminescence, transmission, and UV fluorescence measurements, it is suggested that Ge(+2) plays an important role in the damage mechanism.

Author (GRA)

N84-24353# Los Alamos Scientific Lab., N. Mex.
APPLICATION FOR SURVEYING TECHNOLOGY FOR THE ALIGNMENT OF LARGE OPTICAL SYSTEMS
W. Bauke 1984 11 p refs Presented at ASPACSM Convention, Washington, D.C., 11 - 16 Mar. 1984
(Contract W-7405-eng-36)
(DE84-006005; LA-UR-84-34; CONF-840375-1) Avail: NTIS HC A02/MF A01

Precise alignment of optical elements in large optical systems in difficult if many elements are positioned such that direct alignment or boresighting becomes impossible. A practical approach is to identify discrete optical path segments and align these using standard surveying or optical-tooling instrumentation. An alignment theory must be developed in which the alignment optical path duplicates or closely approximates the optical path of the operational device. The surveying instruments are then used to simulate the optical input beams to the system segments to be aligned. Auxiliary targets and reflectors are added, and the alignment procedure is augmented by standard optical test instrumentation and techniques. Examples are given using theodolies, transits, and levels with autocollimating capability and micrometer adaptors to perform boresighting and autocollimation techniques on segments of the optical train of the Antares Laser Fusion System at Los Alamos National Laboratory. DOE

N84-24354# California Univ., Livermore. Lawrence Livermore Lab.
ADVANCES IN TRANSMISSION X-RAY OPTICS
N. M. Ceglio 1983 26 p refs Presented at the Symp. on X-Ray Microscopy, Gottingen, West Germany, 1 Sep. 1983
(Contract W-7405-eng-48)
(DE84-007235; UCRL-89803; CONF-8309207-1) Avail: NTIS HC A03/MF A01

Recent developments in X-ray optics are reviewed. Specific advances in coded aperture imaging, zone plate lens fabrication, time and space resolved spectroscopy, and CCD X-ray detection are discussed. DOE

N84-24355# Stanford Linear Accelerator Center, Calif.
SOME OPTICS ALTERNATIVES FOR THE FFS
J. E. Spencer 7 Mar. 1984 13 p refs
(Contract DE-AC03-76SF-00515)
(DE84-008255; SU-SLAC-CN-264) Avail: NTIS HC A02/MF A01

The evolution of the SLC Final Focus System (FFS) was discussed in the SLC Red Books and various collider notes. Bulos and Brown and Murray were able to achieve small (BETA)'s with large l1's (the distance between the IP and the effective field boundary of the first quad). However, all current solutions which are compatible with the known constraints of the total path length, aperture and spot size require high gradient, superconducting quads. Such quads are not expected to provide very good inherent field quality (i.e., without correction windings) but expected to be comparatively expensive to build and operate simply. The purpose of this note is to present a more general solution for the FFS telescope which is compatible with the known constraints of detectors, magnet types, available space and the ingoing and outgoing phase space expectations. While a number of different solutions were found, the ones presented provide comparable performance, simpler operation and lower costs. DOE

N84-24356# Forschungsinstitut der Deutschen Bundespost, Darmstadt (West Germany).
TEMPERATURE DEPENDANCE AND TEMPORAL FLUCTUATIONS OF THE BIREFRINGENCE OF SOME SINGLE-MODE FIBERS
Guenther Garlichs Oct. 1983 68 p refs In GERMAN; ENGLISH summary
(FI-452-TBr-56) Avail: NTIS HC A04/MF A01

The birefringence fluctuations of two single-mode 1 m long fibers was investigated at a wavelength of 633 nm. Both fibers are unintentionally birefringent and show beat wavelengths > 2 m. The linear birefringence of one of the fibers drops to one half, when the fiber is warmed up from 20 to 50 C. The other fiber shows a much lower temperature dependence of the birefringence. The birefringence of both fibers fluctuates slowly with time. The rms value of the linear birefringence amplitudes of both fibers is 3 mrad in the case of fiber pieces 1 m long. The influence of temperature, twisting and the length of the fibers on the fluctuations is considered. Similar temperature dependences and fluctuations can be expected to occur at the wavelengths used in optical

communication systems. The phenomena described may not be generalized to all types of single-mode fibers but they show a possible behavior of fiber birefringence. Author (ESA)

N84-24357# National Bureau of Standards, Washington, D.C. Center for Electronics and Electrical Engineering.
OPTICAL FIBER CHARACTERIZATION: ATTENUATION, FREQUENCY DOMAIN BANDWIDTH, AND RADIATION PATTERNS, VOLUME 2
G. E. Chamberlain, G. W. Day, D. L. Franzen, R. L. Gallawa, E. M. Kim, and M. Young Oct. 1983 243 p refs Sponsored in part by the Dept. of Defense 2 Vol.
(PB84-158914; NBS-SP-637-Vol-2; LC-82-600563) Avail: NTIS HC A11/MF A01 CSCL 20F

Optical fiber measurement systems developed at the National Bureau of Standards are described. The topics covered in this volume are attenuation, bandwidth (frequency domain), and far field near field radiation patterns. Each chapter includes a tutorial section and a detailed description of the apparatus. The volume concludes with a glossary of optical communications terms. GRA

N84-24382# Kyoto Univ. (Japan). Dept. of Physics.
CHAOS AND OPTICAL BISTABILITY: BIFURCATION STRUCTURE Abstract Only
K. Ikeda *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24383# Texas Univ., Austin. Dept. of Physics.
OPTICAL BISTABILITY WITH TWO-LEVEL ATOMS Abstract Only
H. J. Kimble, A. T. Rosenberger, and P. D. Drummond (Rochester Univ.) *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24384# Arkansas Univ., Fayetteville. Dept. of Physics.
OPTICAL BISTABILITY, CHAOS IN THE COHERENT TWO PHOTON PROCESSES Abstract Only
G. S. Agarwal (Hyderabad Univ.) and Surendra Singh *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24385# Florence Univ. (Italy).
TURBULENCE AND 1/f NOISE IN QUANTUM OPTICS
F. T. Arecchi *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 6p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24387# Arkansas Univ., Fayetteville. Dept. of Physics.
MULTISTABILITY, SELF-OSCILLATION AND CHAOS IN NONLINEAR OPTICS Abstract Only
H. J. Carmichael, C. M. Savage (Waikato Univ.), and D. F. Walls (Waikato Univ.) *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24388# Arizona Univ., Tucson. Optical Sciences Center.
CHAOS IN OPTICAL BISTABILITY
M. W. Derstine, H. M. Gibbs, F. A. Hopf, and D. L. Kaplan *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24389# Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Electronics.
THE PHYSICAL MECHANISM OF OPTICAL INSTABILITIES
Yaron Silberberg and Israel Bar-Joseph *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24390# Heriott-Watt Univ., Edinburgh (Scotland). Dept. of Physics.
CONNECTION BETWEEN IKEDA INSTABILITY AND PHASE CONJUGATION
W. J. Firth, E. M. Wright, and E. J. D. Cummins *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24391# Rochester Univ., N. Y. Dept. of Physics and Astronomy.
CRITICAL QUANTUM FLUCTUATIONS IN OPTICAL BISTABILITY Abstract Only
Peter D. Drummond *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24392# Arizona Univ., Tucson. Optical Sciences Center.
FLUCTUATIONS IN OPTICAL BISTABILITY: EXPERIMENT WITH SHOT NOISE
S. L. McCall (Bell Telephone Labs.), S. Ovadia, H. M. Gibbs, F. A. Hopf, and D. L. Kaplan *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs Sponsored in part by NSF (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24394# Arizona Univ., Tucson. Optical Sciences Center.
ADVANCES IN GaAs BISTABLE OPTICAL DEVICES
J. L. Jewell, S. S. Tarng, H. M. Gibbs, K. Tai, D. A. Weinberger, A. C. Gossard, S. L. McCall, A. Passner, T. N. C. Venkatesan, and W. Weigmann *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs Prepared in cooperation with Bell Telephone Labs., Murray Hill, N.J. Sponsored in part by NSF, AFOSR and ARO (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24396# Bell Telephone Labs., Inc., Holmdel, N. J.
NONLINEAR OPTICAL INTERFACES
P. W. Smith and W. J. Tomlinson *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24397# Army Missile Command, Redstone Arsenal, Ala. Research Directorate.
MIRRORLESS INTRINSIC OPTICAL BISTABILITY DUE TO THE LOCAL FIELD CORRECTION IN THE MAXWELL-BLOCH FORMULATION
C. M. Bowden, F. A. Hopf (Arizona Univ.), and W. H. Louisell (Univ. of Southern California) *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24401# Brandeis Univ., Waltham, Mass. Dept. of Physics.
OPTICALLY-INDUCED BISTABILITY IN A NEMATIC LIQUID CRYSTAL
Hiap Liew Ong and Robert B. Meyer *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24402# Arizona Univ., Tucson. Optical Sciences Center.
ROOM-TEMPERATURE THERMAL OPTICAL BISTABILITY IN THIN-FILM INTERFERENCE FILTERS AND DYE-FILLED ETALONS Abstract Only
M. C. Rushford, D. A. Weinberger, H. M. Gibbs, C. F. Li (Harbin Inst. of Technology), and N. Peyghambarian *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p refs Sponsored in part by NSF, AFOSR and ARO (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24403# Arizona Univ., Tucson. Optical Sciences Center.
SELF-DEFOCUSING AND OPTICAL CROSSTALK IN A BISTABLE OPTICAL ETALON Abstract Only
K. Tai, H. M. Gibbs, J. V. Moloney, and S. S. Tarng *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 1p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24404# Arizona Univ., Tucson. Optical Sciences Center.
ROUTES TO OPTICAL TURBULENCE IN A DISPERSIVE RING BISTABLE CAVITY CONTAINING SATURABLE NONLINEARITIES
J. V. Moloney, H. M. Gibbs, and F. A. Hopf *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24406# Academy of Sciences of the Ukrainian SSR, Kiev (USSR). Inst. of Physics.
OPTICAL HYSTERESIS AND BISTABILITY IN THE WAVE-FRONT CONJUGATION BY ELECTROOPTIC CRYSTALS Abstract Only
N. V. Kukhtarev, T. I. Semenets, and V. N. Starkov *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 1p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24413# Boston Univ., Mass. Dept. of Physics.
EFFECT OF DRIVING LASER FLUCTUATIONS ON OPTICAL BISTABILITY
Charles R. Willis *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24414# Allied Corp., Mount Bethel, N.J.
OPTICAL BISTABILITY IN NONLINEAR MEDIA AN EXACT METHOD OF CALCULATION
Y. B. Band *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24416# Universidad Politecnica de Madrid (Spain). Dept. de Electronica Cuantica.
EMPIRICAL AND ANALYTICAL STUDY OF INSTABILITIES IN HYBRID OPTICAL BISTABLE SYSTEMS
J. A. Martin-Pereda and M. A. Muriel *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24417# Arizona Univ., Tucson. Optical Sciences Center.
DISTRIBUTED FEEDBACK BISTABILITY IN CHANNEL WAVE-GUIDES
G. I. Stegeman, C. Liao, and H. G. Winful (G.T.E. Labs., Inc.) *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs Sponsored in part by ARO and AFOSR (For primary document see N84-24381 14-76)
(Grant NSF ECS-81-17483)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24421# Johann-Wolfgang-Goethe-Universitat, Frankfurt am Main (West Germany). Inst. fuer Theoretische Physik.
SIMULATIONS OF THE DYNAMICS OF OPTICAL BISTABILITY WITH FLUCTUATIONS
S. W. Koch, H. E. Schmidt, and H. Haug *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24422# Erlangen-Nuremberg Univ. (West Germany). Inst. der Physikalisches.
INSTABILITIES AND CHAOS IN TV-OPTICAL FEEDBACK Abstract Only
G. Haeusler and N. Streibl *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24424# Bell Telephone Labs., Inc., Holmdel, N. J.
OPTICAL BISTABILITY BASED ON SELF-FOCUSING Abstract Only
P. W. Smith and D. J. Eilenberger *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24425# University of Southern California, Los Angeles. Center for Laser Studies.
OPTICAL BISTABILITY IN FOUR-LEVEL NONRADIATIVE DYES
Zhen Fu Zhu and E. Garmire *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs Sponsored in part by NSF (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

N84-24434# Lockheed Missiles and Space Co., Palo Alto, Calif. Quantum Optics Group.
THEORY OF OPTICAL BISTABILITY IN COLLINEAR DEGENERATE FOUR-WAVE MIXING Abstract Only
Richard Lytel *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24435# Brown Univ., Providence, R. I. Div. of Engineering.
A SATURABLE INTERFEROMETER THEORY OF ABSORPTIVE OPTICAL BISTABILITY
N. M. Lawandy and R. P. Willner *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24436# Rome Univ. (Italy). Ist. di Fisica-Facolta di Ingegneria.
BISTABILITY IN OPTICAL WAVEGUIDES Abstract Only
C. Sibilia and M. Bertolotti *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 1p ref (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24442# Manchester Coll. of Science and Technology (England). Dept. of Mathematics.
OPTICAL EXTINCTION THEOREM THEORY OF OPTICAL MULTI-STABILITY BIFURCATIONS AND TURBULENCE IN THE FABRY-PEROT INTERFEROMETER Abstract Only
R. K. Bullough, S. S. Hassan (Ain Shams Univ.), G. P. Hildred, and R. R. Puri *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24443# Manchester Coll. of Science and Technology (England).
OPTICAL BISTABILITY FROM THE DICKE MODEL
R. R. Puri, G. P. Hildred, S. S. Hassan (Ain Shams Univ.), and R. K. Bullough *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24447# Heriott-Watt Univ., Edinburgh (Scotland). Dept. of Physics.
OBSERVATION OF OPTICAL HYSTERESIS IN AN ALL-OPTICAL PASSIVE RING CAVITY Abstract Only
R. G. Harrison, C. Emshary, and I. Al-Saidi *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For

primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24451# GTE Labs., Inc., Waltham, Mass.
LOW POWER OPTICAL BISTABILITY NEAR BOUND EXCITONS IN CADMIUM SULFIDE
M. Dagenais and H. Winful *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24457# Max-Planck-Institut fuer Quantenoptik, Garching (West Germany).
RADIATION PRESSURE INDUCED OPTICAL BISTABILITY Abstract Only
A. Dorsel (Munich Univ.), P. Meystre, E. Vignes, and H. Walther (Munich Univ.) *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

N84-24193# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Lab.
HIGH VALUE TARGET MODELING FOR TACTICAL DECISION AIDS
R. A. Weiss and L. E. Link *In* Army Res. Office Trans. of the 1st Army Conf. on Appl. Math. and Computing Feb. 1984 p 455-476 (For primary document see N84-24173 14-59)
(AD-P002953) Avail: NTIS HC A99/MF A01 CSCL 20/6

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N84-24358# Naval Research Lab., Washington, D. C.
LONG WAVELENGTH LIMIT OF THE CURRENT CONVECTIVE INSTABILITY
J. D. Huba 23 Feb. 1984 34 p
(RR0-3302; S99-QMXB)
(AD-A139172; NRL-MR-5264) Avail: NTIS HC A03/MF A01 CSCL 12/1

The purpose of this paper is to present analytical and numerical results of the linear properties of the current convective instability in the long wavelength regime (kL < 1). The mathematical analysis is similar to that of the long wavelength limit of the E x B instability (from a previous work). The author derives a relatively simple dispersion equation of the mode, and presents simple dispersion relations in both the ion collisional and ion inertial regimes. These analytical results are compared to exact numerical results. The organization of the paper is as follows: (1) the derivation of a differential equation describing the mode; (2) the presentation of both analytical and numerical results; and (3) a summary of findings and a discussion of applications to the auroral ionosphere. GRA

N84-24359# Naval Research Lab., Washington, D. C.
MAGNETIC BUBBLE FORMATION PRODUCED BY AN EXPANDING LASER PLASMA
S. T. Kacenjar, B. H. Ripin, J. A. Stamper, J. Grun, and E. A. McLean 28 Feb. 1984 27 p
(AD-A139188; NRL-MR-5260) Avail: NTIS HC A03/MF A01 CSCL 17/8

A magnetic depleted bubble resulting from the expansion of a laser-generated debris plasma into a low density magnetized background plasma is observed. A compressed magnetic field propagates slightly ahead of the debris plasma and has a thickness on the order of 1 cm. Author (GRA)

N84-24360# Maryland Univ., College Park. Dept. of Physics and Astronomy.
NEUTRAL GAS PLASMA INTERACTIONS AND CRITICAL IONIZATION VELOCITY PHENOMENA Interim Report
K. Papadopoulos 11 Nov. 1983 14041 p Presented at the 25th Ann. Meeting of the Div. of Plasma Phys., Los Angeles, Calif., 7-11 Nov. 1983
(Contract N00014-79-C-0665)
(AD-A139233; AD-E900330; AP-83-083) Avail: NTIS HC A03/MF A01 CSCL 20/9

The interplay of collisional and collisionless phenomena in the interaction of a magnetoplasma streaming through neutral gas produces some of the most fascinating plasma physics phenomena. A key notion controlling such interactions is the existence of a critical velocity (U sub c) effect postulated in an ad hoc fashion by Alfven, in his model of the formation of the solar system. According to Alfven's postulate, whenever the relative velocity between a neutral gas and a streaming magnetoplasma exceeds a value U sub c identical with Square root of (2Esub i/M), where E sub i is the ionization energy and M the mass of the neutral atoms, rapid ionization and anomalous momentum coupling occurs. Guided by recent laboratory and space experiments and plasma physics theory we present the basic plasma physics underlying the interaction. This is followed by a discussion of its relevance to the formation of the solar system and cometary tails, its controlling effect on plasma centrifuges and homopolar generators, and the fascinating possibility that critical velocity phenomena are controlling the space shuttle environment, transforming it into an artificial comet. Author (GRA)

N84-24361# Maryland Univ., College Park. Dept. of Physics and Astronomy.
ON THE PLASMA PHYSICS ON THE BEAM PLASMA DISCHARGE Interim Report
K. Papadopoulos 23 Dec. 1983 23 p
(Contract N00014-79-C-0665)
(AD-A139265) Avail: NTIS HC A02/MF A01 CSCL 20/9

The scaling for the ignition of beam plasma discharge observed in many laboratory experiments is consistent with the requirement for triggering an absolute instability near the plasma frequency (omega sub e). The transition in the scaling with pressure can be attributed to transition from Bohm to classical diffusion losses. Author (GRA)

N84-24362# Naval Research Lab., Washington, D. C.
A TRANSMISSION LINE BRIDGE FOR THE DIAGNOSTICS OF PLASMA CHANNELS
R. E. Pechacek, M. Raleigh, J. R. Greig, T. Dwyer, and J. Ehrlich 7 Mar. 1984 25 p
(ARPA Order 4395; RR0-1109)
(AD-A139286; NRL-MR-5277) Avail: NTIS HC A02/MF A01 CSCL 14/2

This paper describes a device for measuring the average electrical conductivity of a long, narrow, cylindrical plasma. Interest in plasmas of this shape originates from two areas of study: the study of electron beam propagation through neutral gas, and the study of long straight electrical discharges for use as a communication antenna. Propagation of an electron beam through a neutral gas produces an ionized channel whose properties and evolution are very important to the propagation of the beam itself. Long straight electrical discharges are created in a channel that is ionized by a pulsed laser beam focused with a long focal length lens, and the properties of the plasma in this channel are important to the propagation of the electrical discharge along with channel. The properties of these plasmas are inferred from changes in the transmission properties of a transmission line placed close to and parallel to the plasma. In this paper an analysis is made of the relation between the bridge output voltage and the conductivity of the perturbing plasma for the case in which the conductivity is very low. In this case all perturbations on the bridge parameters are small, and linear approximations are appropriate. The usefulness of the bridge, however, extends to plasma well above this low conductivity range, although a different set of approximations may be necessary to make the analysis of the experiment tractable. A transmission line bridge is a device for measuring very small changes in the properties of transmission lines. GRA

N84-24363# Maryland Univ., College Park. Dept. of Physics and Astronomy.
SCALING OF THE BEAM PLASMA DISCHARGE FOR LOW MAGNETIC FIELDS Interim Report
K. Papadopoulos Jan. 1984 27 p
(Contract N00014-79-C-0665)
(AD-A139415; AP-84-026) Avail: NTIS HC A03/MF A01 CSCL 12/1

A theoretical analysis of the scaling law and the value of the threshold current for beam plasma discharge is presented, based on the requirement for an absolute instability near the plasma frequency. It is shown that both the scaling law as well as the numerical values of I sub C are consistent with the experimental data, both in the low and high pressure regimes for weak magnetic field experiments (small omega sub e > capital omega sub e). The differences in scaling between the regimes are attributed to transition from Bohm to classical diffusion. It is found that the value of the pressure minimum for ignition increases linearly with the ambient magnetic field. Author (GRA)

N84-24364# California Univ., Los Angeles. Center for Plasma Physics and Fusion Engineering.
GROWTH RATES OF PARAMETRIC INSTABILITIES DRIVEN BY TWO PUMPS
J. L. Milovich, B. D. Fried, and G. J. Morales Jan. 1984 51 p
(Contract N00014-75-C-0476)
(AD-A139463; PPG-763) Avail: NTIS HC A04/MF A01 CSCL 12/1

The parametric instability growth rate of ion acoustic and Langmuir waves, driven unstable by two uniform pumps near the Bohm-Gross frequency, is calculated as a function of pump amplitudes and frequencies. Two instability mechanisms can be identified: one corresponds to the usual, single pump parametric instabilities (decay and oscillating two stream) while the other is similar to that found in the Mathieu equation. The interaction between these two mechanisms results in a non-monotonic dependence of the growth rate on the pump amplitudes and frequencies: both cancellation and enhancement are obtained for various values of the parameters. An analytic study of the relevant dispersion relation using Hill's method is complemented by numerical studies in both the frequency and time domains. Author (GRA)

N84-24365# Naval Research Lab., Washington, D. C.
THEORY OF BEAM CHANNEL HYDRODYNAMICS
J. M. Picone, J. P. Boris, J. H. Gardner, J. R. Greig, and M. Raleigh 7 Mar. 1984 17 p
(ARPA Order 4395)
(AD-A139595; NRL-MR-5285) Avail: NTIS HC A02/MF A01 CSCL 20/9

This document reports on recent theoretical studies and numerical simulations of hot channels produced in a gaseous medium by a beam. Experiments by Greig et al. have demonstrated that similar channels produced by electric discharges and/or laser pulses in air or nitrogen undergo rapid, turbulent cooling. It explains this phenomenon on the basis of vorticity generation by zero-order misalignment of pressure and density gradients as the hot channel expands to pressure equilibrium. Derived are equations describing the residual vortex strength and mixing time scale for fundamental classes of asymmetry. Comparisons of theoretical calculations to numerical simulations and to experimental data on laser and discharge channels provide a calibration of the theory and permit the identification of the most important sources of turbulence in beam channels. Author (GRA)

N84-24366# Los Alamos Scientific Lab., N. Mex.
MICROTHEORY OF COLLISIONLESS SHOCK CURRENT LAYERS
D. Winske 1984 43 p refs Presented at Chapman Conf. on Collisionless Shock Waves in the Heliosphere, Napa Valley, Calif., 20 Feb. 1984
(Contract W-7405-eng-36)
(DE84-007500; LA-UR-84-512; CONF-840256-1) Avail: NTIS HC A03/MF A01

The present status of understanding of microscopic dissipation processes in the current layer of collisionless shocks is reviewed. The emphasis is on cross field current driven instabilities and their importance in quasiperpendicular shocks, although other processes arise in quasiparallel shocks are also discussed. A general prescription is given for calculating turbulent heating and resistivity in shocks. DOE

N84-24367# Texas Univ., Austin. Inst. for Fusion Studies.
COMPUTER MODELING OF FAST COLLISIONLESS RECONNECTION
J. N. Leboeuf, F. Brunel, T. Tajima, J. Sakai (Toyama Univ.), C. C. Wu (UCLA), and J. M. Dawson (UCLA) Jan. 1984 30 p refs Presented at the Chapman Conf. on Magnetic Reconnection, Los Alamos, N.Mex., 3 Oct. 1983
(Grants DE-FG05-80ET-53088; NSF ATM-82-14730)
(DE84-006714; DOE/ET-53088/112; CONF-83100229-9) Avail: NTIS HC A03/MF A01

Particle simulations of collisionless tearing, reconnection and coalescence of magnetic fields for a sheet pinch configuration show that reconnection is Sweet-Parker like in the tearing and island formation phase. It is much faster to explosive in the island coalescence state. Island coalescence is the most energetic process and leads to large ion temperature increase and oscillations in the merged state. Similar phenomena have been observed in equivalent MHD simulations. Coalescence and its effects, as observed in simulations, may explain many of the features of solar flares and coronal X-ray brightening. DOE

N84-24368# Los Alamos Scientific Lab., N. Mex.
ACOUSTICALLY COMPENSATED TWO-WAVELENGTH INTERFEROMETRY FOR PLASMA DENSITY MEASUREMENTS: ONE-DIMENSIONAL THEORY AND APPLICATIONS
C. J. Buchenauer Feb. 1984 18 p refs
(Contract W-7405-eng-36)
(DE84-007983; LA-9880-MS) Avail: NTIS HC A02/MF A01

Some of the elementary problems encountered in the interferometric measurement of plasma electron densities in acoustically noisy environments are examined. Some theoretical criteria for instrumental designs are established. One interferometer design is described and some experimental results are given. DOE

N84-24369# Texas Univ., Austin. Inst. for Fusion Studies.
STUDY OF GENERALIZED TOROIDAL CUSP CONFIGURATIONS
J. N. Leboeuf, S. T. Ratliff (Lockheed-California Co.), and J. M. Dawson (California Univ., Los Angeles) Jan. 1984 28 p refs
(Contract DE-FG05-80ET-53088)
(DE84-006662; DOE/ET-53088/120) Avail: NTIS HC A03/MF A01

Hot electrons as well as hot ions are a desirable feature of any fusion device. By particle simulations (in slab geometry) and simple theory two variants of the Toroidal Cusp Experiment (TCX) were studied with an eye to achieveing hot electrons, while retaining its large direct ion heating feature. A toroidal field added to the TCX configuration, with cusp magnets arranged poloidally to partly cancel cusp trapping of the electrons insures electron flow across the cusps and electron heating. Helical winding of the cusp magnets around the torus with pitch theta greater than or equal to (m/M)/sup 1/2/ allows trapped electron flow on average helical paths; however, ions can still flow across the cusps and the J. E heating of ions and electrons can be varied at will. DOE

N84-24370# Georgia Inst. of Tech., Atlanta. School of Nuclear Engineering.
SATURATED TEARING MODES IN TOKAMAKS, RENEWAL PROPOSAL Progress Report
Glenn Bateman Jan. 1984 13 p
(Contract DE-AS05-81ER-53117)
(DE84-006851; DOE/ER-53117/T2) Avail: NTIS HC A02/MF A01

A computer code (GTOR) was completed which implements a quasilinear method for determining saturated tearing mode

magnetic island widths in axisymmetric toroidal plasmas. This code was used to survey the effect of current profile, aspect ratio, and plasma elongation on saturated tearing modes. Within the magnetic islands, current peaking was found to have a particularly large effect. A direct method for computing Hamada coordinates from harmonics of the inverse Grad-Shafranov equation was developed. DOE

N84-24371# Los Alamos Scientific Lab., N. Mex.
PARAMETERS OF A POSSIBLE FRC ADIABATIC COMPRESSION EXPERIMENT
M. Tuszewski and R. E. Siemon 1984 5 p refs Presented at the 6th US-Japan Symp. on Compact Toroid Res., Princeton, N.J., 20-23 Feb. 1984
(Contract W-7405-eng-36)
(DE84-007487; LA-UR-84-583; CONF-840255-6) Avail: NTIS HC A02/MF A01

An experiment is described that would address the following research goals for field reversed configurations (FRC): (1) test FRC stability with a number of ion gyroradii relative to the plasma radius substantially greater than in present experiments; (2) increase the electron temperature sufficiently to test the physics of electron energy confinement and of trapped flux losses; (3) improve confinement while remaining in a density regime (n less than or equal to 5 x 10(15) cm(-3)) most likely to be relevant to fusion power production. DOE

N84-24372# Argonne National Lab., Ill.
RELATIVISTIC CORRELATION THEORY OF ATOMIC STRUCTURES
K. T. Cheng 1984 5 p refs Presented at DOE Atomic Phys. Program Contractors Meeting, Gaithersburg, Md., 26 - 27 Apr. 1984
(Contract W-31-109-eng-38)
(DE84-006745; CONF-840481-4) Avail: NTIS HC A02/MF A01

Recycling effects arising from the penetration of cold neutrals into a hot plasma were known to contribute to confinement properties of Tokamaks, mirrors, RFPs, and spheromaks. To date, however, ionization and charge exchange processes associated with the possible influx of neutrals were neglected in FRC transport models, or their effects were found negligible for experiments with short lifetimes (< 20 (MU)s). These processes are also neglected when ascertaining the experimental particle confinement time tau/sub N/. As experimental FRC lifetimes were recently extended to record values (greater than or equal to 300 (MU)s), these effects on transport may no longer be negligible. Furthermore, these losses are enhanced when FRCs translate at axial speeds much greater than the thermal speeds of the neutrals. DOE

N84-24373# Science Applications, Inc., Boulder, Colo. Plasma Research Inst.
BALLOONING PRECESSIONAL INSTABILITIES IN A SINGLE CELL HOT ELECTRON PLASMA
K. T. Tsang, X. S. Lee, B. Hafizi, and T. M. Antonsen, Jr. Dec. 1983 51 p refs
(Contract DE-AC03-76ET-53057)
(DE84-007017; SAI-83-1147; PRI-7) Avail: NTIS HC A04/MF A01

A fourth-order differential eigenequation along a field line for a hot electron plasma in a single mirror-cell system was derived in the large hot electron precession frequency limit. This eigenequation was assessed numerically and also investigated analytically in the electromagnetic-flute limit. Electrostatic ballooning modes can couple with the hot electron processional motion and lead to magnetohydrodynamic instability if the frequency matching condition is satisfied. A stability boundary due to this coupling was explored and generated numerically in appropriate parameter space. DOE

N84-24374# Los Alamos Scientific Lab., N. Mex.
ELECTRICAL CONDUCTIVITY OF AN ARBITRARILY DENSE PLASMA
G. Rinker Jan. 1984 80 p refs
(Contract W-7405-eng-36)
(DE84-008006; LA-9872-MS) Avail: NTIS HC A05/MF A01

This is the first of a series of papers concerning the electrical and thermal transport properties of dense plasmas. Temperatures and densities considered range from zero to 2(13) eV and 2(-13) to 2(13) times compressed. Theoretical calculations of electrical conductivities using the t-matrix version of the Ziman theory with various self-consistent ionic potential models are described. The theoretical basis is described and illustrative results are given. DOE

N84-24375# Rochester Univ., N. Y. Lab. for Laser Energetics.
SHORT-PULSE SHORT-WAVELENGTH OPTICAL PROBE FOR LASER PLASMA
W. Seka and J. Hoose Mar. 1984 25 p refs
(Contract DE-AC08-80DP-40124)
(DE84-008336; DOE/DP-40124/20) Avail: NTIS HC A02/MF A01

A detailed proposal for a short pulse, short wavelength, optical probe which is synchronized with either GDL or OMEGA is presented. Typical probe laser parameters are lambda approx. 2000 A, t approx. = 2 ps, with an energy of several hundred (MJ)J and synchronization of 20 to 50 ps. The present design is based on detailed experimental work done over the past two years in the Picosecond Group at LLE. DOE

N84-24376# Los Alamos Scientific Lab., N. Mex.
TRANSLATION OF FIELD-REVERSE CONFIGURATIONS IN THE FRX C/T EXPERIMENT
Donald J. Rej, W. T. Armstrong, R. E. Chrien, P. L. Klinger, R. K. Linford, K. F. McKenna, R. D. Milroy (Mathematical Sciences NW Inc.), E. G. Sherwood, R. E. Siemon, and M. Tuszewski 1984 6 p refs Presented at the 6th US-Japan Symp. on Compact Toroid Res., Princeton, N.J., 20-23 Feb. 1984
(Contract W-7405-eng-36)
(DE84-007489; LA-UR-84-602; CONF-840255-2) Avail: NTIS HC A02/MF A01

One of the unique features inherent to compact toroids is the potential ability to translate the plasma along its geometric axis. CT translation has proven useful in reactor design studies, and was the focus of several experimental investigations. The initial results from translation experiments performed with the field reversed configuration (FRC) plasmas generated in the FRX-C/T device are reported. DOE

N84-24377# Los Alamos Scientific Lab., N. Mex.
COAXIAL SLOW SOURCE: A QUASI-STATIC FRC FORMATION CONCEPT
K. F. McKenna and R. F. Gribble 1984 5 p refs Presented at the 6th US-Japan Symp. on Compact Toroid Res., Princeton, N.J., 20-23 Feb. 1984
(Contract W-7405-eng-36)
(DE84-007476; LA-UR-84-603; CONF-840255-3) Avail: NTIS HC A02/MF A01

The electromagnetics of one of several techniques for generating FRCs in a coaxial configuration was presented. The discussed design satisfies all the electromagnetic requirements for a slow source. The next major issue is the investigation of the plasma physics which will ultimately determine the viability of this concept. DOE

N84-24378# Texas Univ., Austin. Inst. for Fusion Studies.
FREE-BOUNDARY STABILITY OF STRAIGHT STELLARATORS
D. C. Barnes and John R. Cary Feb. 1984 60 p refs
(Grant DE-FG05-80ET-53088)
(DE84-008272; DOE/ET-53088/128; IFSR-128) Avail: NTIS HC A04/MF A01

The sharp boundary model is used to investigate the stability of straight stellarators to free boundary, long wavelength modes. To correctly analyze the heliac configuration, previous theory is generalized to the case of arbitrary helical aspect ratio (ratio of plasma radius to periodicity lengths). A simple low beta criterion involving the vacuum field and the normalized axial current is

derived and used to investigate a large variety of configurations. The predictions of this low beta theory are verified by numerical minimization of delta W at arbitrary beta. The heliac configuration is found to be remarkably stable, with a critical beta of over 15% determined by the lack of equilibrium than the onset of instability. In addition, other previously studied systems are found to be stabilized by net axial plasma current. DOE

N84-24379# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
THE SIGNIFICANCE OF THE PINCH PHASE FOR THE PRODUCTION OF NEUTRONS IN A PLASMA FOCUS [DIE BEDEUTUNG DER PINCHPHASE FUER DIE NEUTRONENPRODUKTION IM PLASMAFOKUS]
H. J. Kaeppeler, A. Hayd (M.A.N., Munich), M. Maurer (M.A.N., Munich), and P. Meinke (M.A.N., Munich) Mar. 1983 22 p refs In GERMAN Presented at 47th Physikertagung, Regensburg, West Ger., 1983
(IPF-83-2) Avail: NTIS HC A02/MF A01

Neutron production during the pinch phase of the Poseidon plasma focus was investigated. The solutions of the magnetoplasmadynamics equations of the two fluid theory for compression, pinch, and late phase of the plasma focus for pinch currents higher than 500 kA show neutron production in the pinch phase between maximum compression and onset of the m = 0 instability. This was also experimentally observed in the Poseidon plasma focus. The occurrence of quasisolitons, current filamentation, neutron flux, neutron production, and lifetime of the pinch phase are discussed and their significance for the fusion reactor relevance of the plasma focus is pointed out. Author (ESA)

N84-24380# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
MAGNETOACOUSTIC HEATING AND FLUX-CONSERVING-TOKAMAK (FCT) EQUILIBRIA IN A BELT PINCH [MAGNETOAKUSTISCHE HEIZUNG UND FCT-GLEICHGEWICHTE IM BELT-PINCH]
V. Erckmann Feb. 1983 95 p refs In GERMAN
(IPF-83-4) Avail: NTIS HC A05/MF A01

Plasma heating by magnetoacoustic waves and equilibrium in high beta plasmas in Tokamak geometry were studied in the belt pinch HECTOR. The plasma is heated for 5 microsec. by a fast magnetoacoustic wave with a frequency around the first harmonic of the ion cyclotron frequency. High wave absorption is observed. The beta value of the pinch plasma increases from 0.34 at the end of the compression to 0.46 at the end of the RF heating. Strong heating (200 MW) is observed when the resonance layer is in the plasma center. Strong plasma losses of the order of 200 MW are observed after the RF heating due to charge exchange with neutral gas atoms. The plasma equilibria during the plasma heating and following cooling are identified as FCT equilibria. The equilibrium sequences calculated with a two dimensional equilibrium code show qualitative agreement with the experimental observations. Author (ESA)

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N84-24381# Optical Society of America, Washington, D. C.
TOPICAL MEETING ON OPTICAL BISTABILITY Final Report, 1 Jun. 1983 - 31 Jan. 1984
Jarus W. Quinn 31 Jan. 1984 249 p refs Meeting held at Rochester, N.Y., 15-17 Jun. 1984
(Grant AF-AFOSR-0251-83)
(AD-A138998; AFOSR-84-0114TR) Avail: NTIS HC A11/MF A01 CSCL 20/6

The topical meeting on optical bistability was intended to provide an international interdisciplinary forum for the exchange of knowledge on the progress of various aspects of optical bistability and optical nonlinearities. Papers in the following areas were covered: theory, experiments, devices, material properties, instabilities and chaos and coherent switching. For individual titles, see N84-24382 through N84-24457.

N84-24382# Kyoto Univ. (Japan). Dept. of Physics.
CHAOS AND OPTICAL BISTABILITY: BIFURCATION STRUCTURE Abstract Only **c74**
K. Ikeda *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

The phase of the output light from a bistable optical cavity containing a nonlinear dielectric mediumobeysa differential equation with time delay. With the increase of the intensity of the incident light, a delay, the solution exhibits transition from a stationary state to periodic and chaotic states. In the course of this transition, there appear successive bifurcations, which form a hierarchy of coexisting periodic solutions: as the intensity of the incident light is increased, the stationary solution becomes unstable at the first bifurcation point and breaks into a number of periodic ones. These periodic solutions form a set of higher harmonics which coexist with each other. With further increase, each solution further bifurcates into a new set of coexisting periodic solutions. In the chaotic regime, the coexisting periodic states coalesce successively into fewer sets and are reduced to a single chaotic state which totally complicated time evolution. B.G.

N84-24383# Texas Univ., Austin. Dept. of Physics.
OPTICAL BISTABILITY WITH TWO-LEVEL ATOMS Abstract Only **c74**
H. J. Kimble, A. T. Rosenberger, and P. D. Drummond (Rochester Univ.) *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

Absorptive bistability with an intracavity medium that approximates a collection of two-level atoms was examined. For low intracavity atomic density, measurements of the evolution of steady state hysteresis in absorptive bistability are in reasonable quantitative agreement with calculations based upon a single transverse-mode theory in the mean-field limit. Absolute switching intensities for incident and transmitted fields are obtained from measured powers and empty-cavity characteristics. Values of the atomic cooperativity parameter C are likewise computed directly without adjustment. At the largest values of atomic cooperativity investigated, marked departures from the usual steady state description of optical bistability were observed. An evaluation is in progress to assess whether these departures result from spatial effects (due to the range values of resonant absorption or to the excitation of higher order transverse modes) or from the possible existence of dynamical instabilities in the experiment. Author

N84-24384# Arkansas Univ., Fayetteville. Dept. of Physics.
OPTICAL BISTABILITY, CHAOS IN THE COHERENT TWO PHOTON PROCESSES Abstract Only **c74**
G. S. Agarwal (Hyderabad Univ.) and Surendra Singh *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

The cooperative behavior of a system of atoms contained in a ring cavity is investigated under the condition that the fundamental atomic transition is a two photon transition. Maxwell-Block equations are used to obtain the input vs. output relation by adiabatically eliminating all the atomic variables. The fundamental equation that results is a complex two dimensional map-which in the mean field limit reduces to the standard bistability equations. The characteristics of the two dimensional map are numerically investigated. Such a map is shown to lead to chaotic behavior following the Feigenbaum scenario. The sequence of events following first regime of chaos is a set of period having bifurcations. The characteristics of the power spectrum in the region of chaos are presented. The effect of noise on the period doubling

bifurcations in the present model, is also investigated and the connection with the theoretical predictions is established. Author

N84-24385# Florence Univ. (Italy).
TURBULENCE AND 1/f NOISE IN QUANTUM OPTICS **c74**
F. T. Arecchi *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 6p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

An exciting chapter of physics was the study of fluctuations and coherence in lasers: how atoms or molecules, rather than radiating e.m. field independently, decide to cooperate to a single coherent field; then, for still higher excitation, how and why they organize in a complex pattern of space and time domains, with small correlations with one another (optical turbulence). These new features of equatum optical systems are discussed. Author

N84-24386# Milan Univ. (Italy). Ist. di Fisica.
SELF-PULSING, BREATHING AND CHAOS IN OPTICAL BISTABILITY AND THE LASER WITH INJECTED SIGNAL **c36**
L. A. Lugiato and L. M. Narducci (Drexel Univ.) *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/5

Spontaneous pulsations in optical bistability have stimulated considerable interest following its prediction in the framework of the plane wave, ring cavity model and the realization of an electro-optical converter of CW coherent light into pulsed radiation. In a subsequent important development in the dispersive case, the Bonifacio-Lugiato instability leads to chaotic behavior (optical turbulence). Some of the most relevant manifestations of self-pulsing in Optical Bistability are reviewed. Author

N84-24387# Arkansas Univ., Fayetteville. Dept. of Physics.
MULTISTABILITY, SELF-OSCILLATION AND CHAOS IN NONLINEAR OPTICS Abstract Only **c74**
H. J. Carmichael, C. M. Savage (Waikato Univ.), and D. F. Walls (Waikato Univ.) *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

A system comprising two circularly polarided ring-cavity modes coupled via a J=1/2 to J=1/2 transition is described. Both modes are equally excited by a linearly polarized incident laser. The steady state transmission of the cavity shows optical tristability and polarization switching. The chaotic region was studied numerically as the incident laser intensity and the detuning of the cavity modes is varied. The routes to chaos appear to be analogous to those in the Lorenz equations. Choas was predicted in two similar systems where a pair of ring cavity modes are coupled via a two photon transition and a second order nonlinear susceptibility. In two photon optical bistability the practise was to neglect the Stark shift associated with the levels mediating the two photon transition. With the inclusion of Stark shifts self-oscillations and chaos were found in a model for two-photon bistability. Author

N84-24388# Arizona Univ., Tucson. Optical Sciences Center.
CHAOS IN OPTICAL BISTABILITY **c74**
M. W. Derstine, H. M. Gibbs, F. A. Hopf, and D. L. Kaplan *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

Experiments on chaos in a hybrid optically bistable system with delayed feedback are presented. Special attention is paid to the connection of these experiments to the issue of what chaos is, and why it has recieved such considerable attention in recent years. Author

N84-24389# Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Electronics.
THE PHYSICAL MECHANISM OF OPTICAL INSTABILITIES **c74**
Yaron Silberberg and Israel Bar-Joseph *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

Nonlinear optical systems transforms a continuous wave input beam, if it is intense enough, into an oscillating light output. The system which was most thoroughly studied is an optical resonator, usually of the ring type, containing either a Kerr medium or a two-level medium. Unfortunately, the mathematical approaches of these studies do not lend themselves to a tractable intuitive explanation of the self-pulsation phenomena, and do not identify the physical origin of instabilities. A different approach, showing that optical instabilities stem from one source, namely, gain generated by four-wave mixing processes was considered. This gain, together with feedback supplied by the resonator, leads to oscillation of sidebands of the input field. The beating between these sidebands and the input field causes the oscillating output intensity. The salient feature of our approach lies in its intuitive appeal, namely, it is possible to predict the behavior of the system for a wide range of parameters. Moreover, the model enables understanding of the system's evolvement beyond the first bifurcation, something usually not possible with the other approaches. Author

N84-24390# Heriott-Watt Univ., Edinburgh (Scotland). Dept. of Physics.
CONNECTION BETWEEN IKEDA INSTABILITY AND PHASE CONJUGATION **c74**
W. J. Firth, E. M. Wright, and E. J. D. Cummins *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

Period-doubling to chaos and phase conjugation are two nonlinear optical phenomena which have attracted enormous but largely independent interest in recent years. A close connection between the two phenomena, both being forms of near-degenerate four-wave mixing is established. Author

N84-24391# Rochester Univ., N. Y. Dept. of Physics and Astronomy.
CRITICAL QUANTUM FLUCTUATIONS IN OPTICAL BISTABILITY Abstract Only **c74**
Peter D. Drummond *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

Intrinsic optical bistable elements that were investigated to date typically are either high-Q devices dominated by the interferometer relaxation, or else are fast switching devices dominated by relatively slow population transfers. In the case of the one-mode quantum theory of optical bistability with two-level atoms, these limits are treated in a unified way with a single Fokker-Planck equation. In the critical region, a great increase in fluctuations occurs. This has the potential of allowing quantum fluctuations to be directly observed, either through fast quantum tunnelling measurements or through observations of intensity correlations. However the standard calculation of intensity correlations, which involves linearizing the Fokker-Planck equation, cannot be used to calculate critical fluctuations. Author

N84-24392# Arizona Univ., Tucson. Optical Sciences Center.
FLUCTUATIONS IN OPTICAL BISTABILITY: EXPERIMENT WITH SHOT NOISE **c74**
S. L. McCall (Bell Telephone Labs.), S. Ovadia, H. M. Gibbs, F. A. Hopf, and D. L. Kaplan *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs Sponsored in part by NSF (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

The behavior of an optical bistable system in which the fluctuations play the dominant role was studied on the basis of a Fokker-Planck description. However, all the analyses so far approximate the fluctuations as arising from a constant external noise source described by a delta-correlated, Gaussian random process. Intensity-dependent shot noise fluctuations of a bistable

system are experimentally studied for the first time, using a hybrid bistable optical device, and analyzed by a simple ladder model that fits the data well. Author

N84-24393# Heriott-Watt Univ., Edinburgh (Scotland). Dept. of Physics.
ROOM TEMPERATURE OPTICAL BISTABILITY IN SEMICONDUCTORS AND REALIZATION OF OPTICAL AND GATES Abstract Only
S. D. Smith *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 1p (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

Recent measurements of parameters concerning dynamic third order nonlinearity for both 77K and 300K near the band gap of InSb are reviewed. New measurements and theory of carrier lifetimes are now available. Optical bistability at room temperature was observed in a situation where two-photon excitation is the prime agent for populating states near the conduction band minimum. X(3) is approximately 10(-4) e.s.u. is implied with a response time of 30 ns at an intensity of approximately 100 kW/sq. cm. Thus similar power levels to those seen in GaAs devices are demonstrated. Using the more sensitive 77K 5 micron region where CW holding of the device near switch point is possible, and gate operation is demonstrated and definite switching energies of approximately 5 nJ determined. Delay of one of the switching pulses gives implicit information on carrier lifetime. Interaction of such logic elements over various path lengths is also discussed. Author

N84-24394# Arizona Univ., Tucson. Optical Sciences Center.
ADVANCES IN GaAs BISTABLE OPTICAL DEVICES c74
J. L. Jewell, S. S. Tarng, H. M. Gibbs, K. Tai, D. A. Weinberger, A. C. Gossard, S. L. McCall, A. Passner, T. N. C. Venkatesan, and W. Weigmann *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs Prepared in cooperation with Bell Telephone Labs., Murray Hill, N.J. Sponsored in part by NSF, AFOSR and ARO (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

Bistable optical devices (BOD's) using GaAs as the nonlinear medium are viable candidators for the achievement of fast (< ns), room temperature, low-power (mw), externally controllable optical switches which are easily fabricated and operated. Advances were made in all of these areas and efforts are in progress to improve performances in ways that are simultaneously compatible. Author

N84-24395# University of Southern California, Los Angeles. Center for Laser Studies.
NONLINEARITIES AT THE BANDGAP IN InAs
Craig D. Poole and E. Garmire *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs Sponsored in part by NSF (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

InSb was shown to exhibit bistability and a very large nonlinear index. A semiconductor which is similar, but which has a bandgap at shorter wavelengths is InAs. Measurements of saturable absorption in InAs using an HF laser, which matches the bandgap of InAs at temperatures from 5 to 100 K are presented. Using these measurements we have calculated a nonlinear refractive index of n (sub 2) = 2 x 10(-5) sq cm/w near but below the bandgap. These numbers are comparable to those measured in InSb and indicate that InAs may be a good material for bistable devices. Author

N84-24396# Bell Telephone Labs., Inc., Holmdel, N. J.
NONLINEAR OPTICAL INTERFACES c74
P. W. Smith and W. J. Tomlinson *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

The results of previous theoretical and experimental studies of nonlinear interfaces are reviewed and new experimental results are obtained using a liquid suspension of dielectric particles as the nonlinear medium. This medium has sufficiently large nonlinearity to permit nonlinear interface experiments to be performed with low-power CW laser beams. Simple, direct experimental verification of theoretical predictions is now possible. M.A.C.

N84-24397# Army Missile Command, Redstone Arsenal, Ala. Research Directorate.
MIRRORLESS INTRINSIC OPTICAL BISTABILITY DUE TO THE LOCAL FIELD CORRECTION IN THE MAXWELL-BLOCH FORMULATION c74
C. M. Bowden, F. A. Hopf (Arizona Univ.), and W. H. Louisell (Univ. of Southern California) *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

The Maxwell-Bloch model is used in conjunction with a Local Field Correction (LFC) to represent a collection of two-level atoms interacting with an externally-applied coherent field. The results of numerical calculations are presented for the case of a small volume of nearly resonant absorbing medium (i.e., a volume smaller than a resonant wavelength) in one-special dimension. The usual slowly-varying envelope and phase approximations are not valid for this case and the conditions on the field and its derivatives at the dielectric boundaries are explicitly satisfied. For suitable values for the material parameters, a bistable exists between the applied incident field and the output field, which is due entirely to the local field correction. M.A.C.

N84-24398# Sperry Research Center, Sudbury, Mass.
OPTICALLY INDUCED CHANGES IN THE FARADAY ROTATION SPECTRA OF THE FERROMAGNETIC SEMICONDUCTOR CdCr/SUB 2/Se/SUB 4 Abstract Only
Norman A. Sanford *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p refs (For primary document see N84-24381 14-76)
(Contract F49620-C-0182)
Avail: NTIS HC A11/MF A01 CSCL 20/12

The chromium chalcogenide, CdCr2Se4, the most extensively studied Cr spinel, is ferromagnetic and orders at 130 K. The optical absorption edge is found to red shift for temperatures below the Curie point. Faraday rotation spectra measured near the absorption edge are highly dispersive with peak rotation increasing and shifting to the red as temperature is reduced. The rotation spectra scanned at fixed temperature display zero crossings characteristic of the temperature. The red shifting of both the absorption edge as well as the rotation dispersion result from increased magnetic order with reduced temperature. Selective repopulation of magnetically active bands by the pumping radiation is found to account for the observations. M.A.C.

N84-24399# Heriott-Watt Univ., Edinburgh (Scotland). Dept. of Physics.
MULTI-PARAMETER UNIVERSAL ROUTE TO CHAOS IN A FABRY-PEROT RESONATOR c64
E. Abraham and W. J. Firth *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 12/1

Positive branch instabilities in nonlinear resonators in the Fabry Perot (folded) configuration are investigated. The dispersive limit of the Maxwell Bloch equations (Kerr medium) are examined. The finite longitudinal relaxation time (T) means that diffusion of the excitation is possible, and it is assumed that the diffusion length greatly exceeds the wavelength. The equations for the nonlinearity, the forward and the backward fields are derived and explained. M.A.C.

N84-24400# Rochester Univ., N. Y. Inst. of Optics.
BISTABLE OPERATION OF TWO SEMICONDUCTOR LASERS IN AN EXTERNAL CAVITY: RATE-EQUATION ANALYSIS c36
T. G. Dziura (Lab. for Laser Energetics) and D. G. Hall *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p

refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/5

This paper describes a theoretical analysis of the steady state and transient behavior of a laser with saturable absorber system consisting of two GaAlAs semiconductor laser elements in an external cavity. The equations are included and explained. M.A.C.

N84-24401# Brandeis Univ., Waltham, Mass. Dept. of Physics.
OPTICALLY-INDUCED BISTABILITY IN A NEMATIC LIQUID CRYSTAL **c74**
Hiap Liew Ong and Robert B. Meyer *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

The purely optical field induced molecular reorientation in a homeotropically oriented Nematic Liquid Crystal (NLC) by a normally incident light wave is investigated. The exact solution describing the orientation of the director is discussed. By examining the deformation angle near the threshold, the criterion for the existance of a first order Freedericks transition is obtained. M.A.C.

N84-24402# Arizona Univ., Tucson. Optical Sciences Center.
ROOM-TEMPERATURE THERMAL OPTICAL BISTABILITY IN THIN-FILM INTERFERENCE FILTERS AND DYE-FILLED ETALONS Abstract Only **c74**
M. C. Rushford, D. A. Weinberger, H. M. Gibbs, C. F. Li (Harbin Inst. of Technology), and N. Peyghambarian *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p refs Sponsored in part by NSF, AFOSR and ARO (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

Thin-film interference filters may be potential practical bistable devices due to their room temperature operation, extreme thinness, ease of production, and low-power operation. Thermal optical bistability is observed at mW powers in narrow-band visible interference filters with ZnS and ZnSe spacers. Thermal optical bistability can be defined as dispersive optical bistability in which the intensity dependence of the optical path length arises from a temperature change of the intracavity medium. The slow switching times (200 pico seconds at best), the sign of the nonlinearity and the laser etalon detuning are consistent with a thermal mechanism. Proper input focusing is critical. In general the bistability loop drifted in time, preventing CW operation. As the filter heated up, the cavity progressively detuned, causing the switch-on intensity to increase in time. Also, in a ZnS 514.5-nm filter an irreversible change in transmission and shift of the peak by 1.2-nm to shorter wavelength was observed. M.A.C.

N84-24403# Arizona Univ., Tucson. Optical Sciences Center.
SELF-DEFOCUSING AND OPTICAL CROSSTALK IN A BISTABLE OPTICAL ETALON Abstract Only **c74**
K. Tai, H. M. Gibbs, J. V. Moloney, and S. S. Tarng *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 1p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

Self focusing effects in optical bistable hysteresis loops have been observed in a GaAsGaAlAs superlattice. Drastic overshooting in the hysteresis loops and changes in the output profile are observed as the imaging lens is translated along the propagation direction, thus imaging different object planes onto a fixed image plane. Nearly identical results are found by a one transverse dimension numerical simulation of good cavity bistability in which the output is free-space propagated backwards in space, corresponding to the movement of the imaging lens. These effects arise from a radially dependent phase shift caused by the excitonic nonlinear refraction and a Gaussian beam profile. The parallel operation of neighboring optical bistable devices on the same etalon is also simulated numerically in both one and two transverse dimension cases. Diffractive coupling can cause a device operating in the lower branch to switch to the upper branch when its neighbor is switched on. A separation of a few beam widths is sufficient for independent operation. M.A.C.

N84-24404# Arizona Univ., Tucson. Optical Sciences Center.
ROUTES TO OPTICAL TURBULENCE IN A DISPERSIVE RING BISTABLE CAVITY CONTAINING SATURABLE NONLINEARITIES **c74**
J. V. Moloney, H. M. Gibbs, and F. A. Hopf *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

Qualitative understanding of transitions to low level turbulence in low aspect ratio, low Reynolds number systems by studying mappings of one and two dimensional nonlinear functions is examined. No quantitative relation appears to exist between fluid parameters and the parameters appearing in the mappings. The Fiegenbaum period doubling sequences represent a subset of a much more general class of instabilities. As an explicit example, a unidirectional ring bistable cavity containing a nonlinear saturable medium is studied. In the plane wave approximation and in the limit that the nonlinear medium response is much faster than a cavity roundtrip time tR (= L/c, L = total cavity length), the dynamics of the complex intra-cavity field reduces a conformal map. When transverse variations are allowed for new transition sequences appear which are consistent with the Ruelle Takens picture of the transition to turbulence. Bifurcation sequences involving outputs which go through periodic, quasiperiodic, frequency locked, followed by period doubling of the locked outputs are common, in marked contrast to plane wave predictions. The numerically computed dynamical outputs of the optical cavity show remarkable similarities to measured radial velocity outputs from a recent fluid dynamical experiment. M.A.C.

N84-24405# Western Electric Co., Inc., Princeton, N.J. Engineering Research Center.
RESONANT FRUSTRATED TOTAL REFLECTION (FTR) APPROACH TO OPTICAL BISTABILITY IN SEMICONDUCTORS Abstract Only
Bruno Bosacchi and Lorenzo M. Narducci (Drexel Univ.) *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p ref (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

The resonant FTR (Frustrated Total Reflection) approach, as an experimental configuration is discussed. A numerical study of the optical response of a nonlinear FTR optical cavity as a function of the incident power, using the plane wave approximation and assuming a uniform enhancement of the optical field in the cavity layer is described. Preliminary estimates of the critical intensity for the switching of the system from high to low reflectivity regime suggest that, with respect to the nonlinear interface configuration, a reduction of at least one order of magnitude can be expected. This fact, and the possibility of a convenient angle of incidence, point to the non-linear FTR optical cavity as a better candidate for the experimental study of nonlinear effects. The relationship, and some potential advantages, of the resonant FTR approach with respect to the waveguide and the surface-plasmon configurations are also examined. M.A.C.

N84-24406# Academy of Sciences of the Ukrainian SSR, Kiev (USSR). Inst. of Physics.
OPTICAL HYSTERESIS AND BISTABILITY IN THE WAVE-FRONT CONJUGATION BY ELECTROOPTIC CRYSTALS Abstract Only **c74**
N. V. Kukhtarev, T. I. Semenets, and V. N. Starkov *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 1p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

Analytical and numerical investigtion of the wave-front conjugation in electrooptic crystals (LiNbO3, BaTiO3, SBN) show that noncavity optical instability and hysteresis depend as much on the dominant mechanism of nonlinear response (diffusion or drift) as on the orientation of the crystal C axis, and is strongly influenced by absorption or gain. Calculation show that critical effects may be observed for crystal lengths 0.1 cm (SBN, BaTiO3) and 1.5 cm (LiNbO3) for the optimal experimental geometry. M.A.C.

N84-24407# Johann-Wolfgang-Goethe-Universitat, Frankfurt am Main (West Germany). Inst. fuer Theoretische Physik.
THEORY OF RESONANCE-ENHANCED OPTICAL NONLINEARITIES IN SEMICONDUCTORS
H. Haug *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

A calculation of the dielectric function is developed which is valid from the low intensity excitonic limit up to the quasi metallic high intensity limit in which free carrier screening is the most important feature. The contribution of the excitons to the screening is neglected and used a quasi-static RPA approximation. The integral equation for the complex polarization function is solved numerically by matrix inversion. The resulting complex dielectric function gives immediately both the absorption and the refraction spectra without using a Kramers Kronig transformation. M.A.C.

N84-24408# Bell Telephone Labs., Inc., Holmdel, N. J.
ROOM TEMPERATURE OPTICAL NONLINEARITIES IN GaAs MULTIPLE QUANTUM WELLS
A. B. Miller, D. S. Chemla, A. C. Gossard, and P. W. Smith *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

By confining carriers in GaAs quantum wells spaced apart with GaAlAs barriers, exciton resonances can be observed at room temperature, primarily because the confinement leads to an increase in binding energy, whereas in GaAs the resonance has all but disappeared at room temperature. Optical absorption near the resonance creates excitons; within 0.5 pico seconds these excitons are ionized into free electrons and holes. This free carrier density interferes with the production of further excitons, thus altering the excitonic absorption spectrum. The free carriers (and consequently the canages in absorption and refraction) decay with 20 nanoseconds lifetime. M.A.C.

N84-24409# Rochester Univ., N. Y. Dept. of Physics and Astronomy.
OBSERVATION OF BISTABILITY IN A JOSEPHSON DEVICE Abstract Only
Barry Muhfelder and Warren W. Johnson *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

A type of bistable behavior not seen before in other Josephson devices is examined. The observed behavior appears to have certain similarities to optical multistability. The output variable of this device (a voltage) will switch spontaneously back and forth between two values that are in the ratio of roughly 5 to 2. This is qualitatively different from the type of bistability conventionally observed in Josephson devices; where one of the states is the zero voltage state. These two stable states represent the phase locking of the oscillations of the Josephson junctions to either one or the other of the two lowest order odd half wave resonances of the transmission line. This would then explain the two output voltage states, because the Josephson relation requires that the average frequency and the voltage be in exact proportion. M.A.C.

N84-24410# Rochester Univ., N. Y. Dept. of Physics and Astronomy.
THEORY OF MULTISTABILITY IN JOSEPHSON JUNCTION DEVICES
Peter D. Drummond, Barry Muhfelder, and Warren W. Johnson *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

A nonlinear perturbation theory is discussed that includes the nonlinearities of the Josephson equations to zeroth order. A renormalization of the zeroth order solution is then used to remove secular terms from the perturbative solutions. This results in relatively simple input-output relations that are applicable to typical current driven Josephson devices. The renormalization method is fist used to deal with the theory of the onset of capacitive (lightly damped) bistability in single junctions. Next the theory of waveguide superconducting quantum interference devices is described. Optical multistability is obtained in the sense of multistable mode intensities in the waveguide. The state equations depend on the external flux, through the flux quantization relations. A physical picture of the origin of the multistability is presented. The fine scale time evolution of the system was simulated numerically. M.A.C.

N84-24411# Rochester Univ., N. Y. Inst. of Optics.
INTRINSIC INSTABILITIES IN HOMOGENEOUSLY BROADENED LASERS Abstract Only **c36**
Lloyd W. Hillman, Robert W. Boyd, Jerzy Krasinski, and C. R. Stroud, Jr. *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/5

Elementary theoretical treatments of homogeneous broadening predict that such lasers can operate in only a single mode, because all of the atoms constituting the gain medium experience identical degrees of saturation. These same arguments apply in the case of a homogeneously broadened absorber. The saturated medium is unstable to the development of self modulation which allows modes symmetrically displaced from the original mode to grow. These modes are locked in a definite relative phase and amplitude. They are natural modes which satisfy a simple eigenvalue equation. This effect occurs in an amplifier as well as in an absorber, and in the case of an amplifier it can lead to higher gain in the wings than near line center. The laser becomes unstable and switches to multimode behavior with a characteristic mode separation. M.A.C.

N84-24412# Bell Telephone Labs., Inc., Murray Hill, N. J.
ZEEMAN COHERENCE EFFECTS IN ABSORPTIVE POLARIZATION BISTABILITY Abstract Only
Govind P. Agrawal *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

The effect of Zeeman coherence on absorptive polarization bistability is considered. The nonlinear medium placed inside a ring cavity is modeled in terms of a homogeneously broadened, folded three level system. Its response to an arbitrarily polarized incident beam is obtained using the density matrix formalism under fairly general relaxation conditions. The collisional decay of Zeeman coherence is allowed through a dephasing relaxation rate. It is indicated that the mode coupling decreases with the increase in the Zeeman coherence dephasing rate. In the absence of collisional dephasing, the bistability state equation are simplified. The situation is similar to that of a two level system except that both modes participate in optical saturation of each one photon resonance. Novel features which arise from this cross saturation are discussed. It is shown that the collisional decay of Zeeman coherence affects the behavior of such an optical bistable device. The effects of Zeeman splitting in the presence of an axial magnetic field are examined. E.A.K.

N84-24413# Boston Univ., Mass. Dept. of Physics.
EFFECT OF DRIVING LASER FLUCTUATIONS ON OPTICAL BISTABILITY **c74**
Charles R. Willis *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

The effect of driving laser fluctuations on the amplitude of the internal field is reviewed. The amplitude of the internal field is more sensitive to driving laser fluctuations than is the phase of the internal field because the internal field amplitude exhibits critical slowing down at the turning points of the optical bistability (OB) curve while the internal field phase variable does not. It is found that the effect of amplitude and phase fluctuations of the

driving laser have different consequences for absorptive and dispersive fields. E.A.K.

N84-24414# Allied Corp., Mount Bethel, N.J.
OPTICAL BISTABILITY IN NONLINEAR MEDIA AN EXACT METHOD OF CALCULATION **c74**
Y. B. Band *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

A method for calculating propagation through nonlinear media for a number of nonlinear phenomena was formulated. This method does not use the SVEA and can therefore solve nonlinear propagation problems when refraction and reflection at the boundary interfaces are important. The first calculation using (albeit numerical) method is reported. Optical bistability in a thin film whose index of refraction is intensity dependent was studied. E.A.K.

N84-24415# Universidad Politecnica de Madrid (Spain). Dept. de Electronica Cuantica.
SELF-BEATING INSTABILITIES IN BISTABLE DEVICES Abstract Only
J. A. Martin-Pereda and M. A. Muriel *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

Optical bistability and the effect of a delayed feedback on instabilities pointing out that the transmitted light from the system can be periodic or chaotic in time under certain conditions are discussed. This phenomenon was confirmed in hybrid bistable optical devices with PLZT as electrooptical material. Similar effects were reported in LiNbO3 in which a coaxial line was employed as delay. It is shown that sustained oscillatory optical output appears under the instable condition. Similar effects can be obtained from liquid crystal cells under suitable conditions. An analytical model of some of the obtained oscillatory optical outputs is presented. E.A.K.

N84-24416# Universidad Politecnica de Madrid (Spain). Dept. de Electronica Cuantica.
EMPIRICAL AND ANALYTICAL STUDY OF INSTABILITIES IN HYBRID OPTICAL BISTABLE SYSTEMS **c74**
J. A. Martin-Pereda and M. A. Muriel *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

The instabilities of electro-optic bistable devices with delay feedback which gives the instability condition for oscillation to appear was analyzed. This condition will be given for the two types of curves more commonly used, namely I out vs. I in and transmission versus voltage. Optical turbulence and periodic oscillations are easily seen with a hybrid optically bistable device with a delay in the feedback. This behavior was studied., different types of differential equations which describe their properties. In the case of hybrid optical bistable devices the curve transmission versus applied voltage is the most useful parameter. E.A.K.

N84-24417# Arizona Univ., Tucson. Optical Sciences Center.
DISTRIBUTED FEEDBACK BISTABILITY IN CHANNEL WAVEGUIDES **c74**
G. I. Stegeman, C. Liao, and H. G. Winful (G.T.E. Labs., Inc.) *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs Sponsored in part by ARO and AFOSR (For primary document see N84-24381 14-76)
(Grant NSF ECS-81-17483)
Avail: NTIS HC A11/MF A01 CSCL 20/6

Goals in optical bistability are outlined: (1) to reduce the power required for switching between two states; and (2) to reduce the material volume. An obvious approach is to minimize the cross sectional area of the beam, for example by using channel waveguides of the type. A grating milled into the surfaces can be used as the distributed feedback mechanism. A channel, guided wave, distributed feedback geometry and present numerical results for InSb waveguides are analyzed. E.A.K.

N84-24418# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
CYCLOTRON BISTABILITY OF ELECTRONS IN VACUUM AND SEMICONDUCTORS Abstract Only
A. E. Kaplan *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

The feasibility of an optical cyclotron bistability of free electrons in vacuum and of conductive electrons in semiconductors is discussed. It is shown that the cyclotron bistability of the free electrons can be based on the dependence of a cyclotron frequency of forced oscillations on the relativistic mass of the electron and on its momentum. It is also suggested that the analogous effect could be feasible in semiconductors whose conductive electrons have a particularly strong dependence of their effective masses on energy (or momentum) of their excitation. The main advantageous features of the cyclotron bistability in semiconductors are that the effective mass of electrons in some semiconductors is very small which results in a considerable decrease of a required magnet field for a given resonant frequency, and the nonlinearity associated with conductive electrons in semiconductors is by many orders of magnitude larger than the relativistic nonlinearity of free electrons, which allows for a fairly low critical pumping intensity, even if a faster relaxation time in semiconductors is considered. The unified theory of both of those effects is developed. E.A.K.

N84-24419# GTE Labs., Inc., Waltham, Mass.
SWITCHING BEHAVIOR OF BISTABLE RESONATORS FILLED WITH TWO-LEVEL ATOMS Abstract Only
E. Chang, G. Cooperman, M. Dagenais, and H. Winful *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

The switching dynamics of bistable optical devices are reported. The intracavity medium is modelled as an ensemble of two level atoms which may be either homogeneously or inhomogeneously broadened. By allowing for arbitrary atomic detunings and cavity mistunings, both the absorptive and dispersive contributions to optical bistability are included. Standing waves are considered in the usual way through Fourier expansions. E.A.K.

N84-24420# GTE Labs., Inc., Waltham, Mass.
POLARIZATION BISTABILITY IN CHOLESTERIC LIQUID CRYSTALS Abstract Only
Herbert G. Winful *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p ref (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

Cholesteric liquid crystals possess an intrinsic helical structure which enables them to selectively reflect circularly polarized light if the wavelength of the light matches the pitch of the helix. It was shown that intense light can change the pitch of the cholesteric and lead to a bistable reflection characteristic for wavelengths in the Bragg regime. In the Mauguin limit there are no Bragg reflections and, except for normal dielectric reflections, an incident wave will enjoy 100% transmission. It is found that the cholesteric represents a twisted, birefringent medium, and the polarization state of the light evolves periodically in space. E.A.K.

N84-24421# Johann-Wolfgang-Goethe-Universitat, Frankfurt am Main (West Germany). Inst. fuer Theoretische Physik.
SIMULATIONS OF THE DYNAMICS OF OPTICAL BISTABILITY WITH FLUCTUATIONS **c74**
S. W. Koch, H. E. Schmidt, and H. Haug *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

The Langevin equation for the fluctuating light-field E in a nonlinear semiconductor resonator was derived. The stationary

properties of eq. were investigated and the details of optical bistable operation were determined. Numerical solutions of eq. are presented to study the dynamic effects of the system. The noise source F(t) is simulated by random numbers and the most probable value of e.g., the field intensity in the resonator (I) is obtained by averaging over many stochastically independent realization. Author

N84-24422# Erlangen-Nuremberg Univ. (West Germany). Inst. der Physikalisches.
INSTABILITIES AND CHAOS IN TV-OPTICAL FEEDBACK Abstract Only **c74**
G. Haeusler and N. Streibl *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

A TV optical feedback experiment was performed by a TV camera looking onto its own monitor. Signal processing was introduced to the system as convolutions, image subtraction, nonlinearities, which gives many applications: linear systems were assumed and systems for image restoration, iterative image processing were obtained for the solution of partial differential equations. The introduction of nonlinearity in the feedback loops may cause completely new effects. These effects which occur in many different physical systems are synergetic effects. E.A.K.

N84-24423# Otago Univ., Dunedin (New Zealand). Dept. of Physics.
POLARIZATION SWITCHING WITH J=1/2 TO J=1/2 ATOMS IN A RING CAVITY
W. J. Sandle, M. W. Hamilton, and R. J. Ballagh *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

A steady state theory for the polarization behavior of the output of a ring optical cavity that contains a vapor of atoms with a drawn J = 1/2 to J = 1/2 transition are reported. The input laser radiation may have arbitrary polarization and detuning. A previously reported theory is extended to include detunings and magnetic fields. E.A.K.

N84-24424# Bell Telephone Labs., Inc., Holmdel, N. J.
OPTICAL BISTABILITY BASED ON SELF-FOCUSING Abstract Only **c74**
P. W. Smith and D. J. Eilenberger *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

Studies of optical multistability due to spot size oscillations are reported. It was shown that a self-focused beam in a nonlinear medium would exhibit hysteresis if the beam were reflected back on itself. The effect was demonstrated by a dye laser beam and Na vapor as the nonlinear medium. By considering the saturation of the nonlinearity, more complex behavior was predicted. This behavior is due to oscillations of the spot size as the self-focused beam propagates through the nonlinear medium. E.A.K.

N84-24425# University of Southern California, Los Angeles. Center for Laser Studies.
OPTICAL BISTABILITY IN FOUR-LEVEL NONRADIATIVE DYES **c74**
Zhen Fu Zhu and E. Garmire *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs Sponsored in part by NSF (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

Most saturable dyes show a large unsaturable loss which removes the possibility of purely absorptive bistability. Nonradiative dyes such as those used for Q-switching have an intense dependent phase shift which may allow bistability. It is shown that this nonlinear refractive index comes from the population redistribution during saturable absorption. E.A.K.

N84-24426# University of Southern California, Los Angeles. Center for Laser Studies.
TRAVELLING WAVE BISTABILITY
J. A. Goldstone and E. Garmire *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p ref Sponsored in part by NSF (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

Bistability without feedback baséd on a quantum mechanical analog of the classical Duffing oscillator that leads to a bistable susceptibility tensor was investigated. Optical bistability which occurs with unique boundary conditions but a nonunique wave equation, due to bistability in the susceptibility tensor are described. Author

N84-24427# Waikato Univ., Hamilton (New Zealand). Dept. of Physics.
QUANTUM THEORY OF OPTICAL EXCITONIC BISTABILITY Abstract Only **c77**
C. W. Gardiner and M. L. Steyn-Ross (York Univ.) *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

A fully quantum mechanical formulation of the electron-hole-exciton-light system is developed following the work of Hanamura. In this method exciton bose operators are introduced to describe electron-hole pairs, and antisymmetrization effects are taken account of by a unitary transformation of the system operators, which introduces extra nonlinearities into the hamiltonian. This means that exclusion principle effects at high exciton densities are fully accounted for. The theory is formulated for Wannier (non-localized) excitons. Damping of light and excitons is accounted for by inclusion of heat baths which are eliminated to give a Q.M. master equation for the photon-exciton system alone. B.W.

N84-24428# Alabama Univ., Huntsville. Dept. of Physics.
OPTICAL BISTABILITY IN SEMICONDUCTORS Abstract Only
C. C. Sung and C. M. Bowden (Army Missile Command) *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

There are two different models to explain the observed optical bistability (OB) in GaAs. Haken and Goll use the saturation of the two-level (electron and hole) atoms as the mechanism of OB, whereas the Stark shift of excitons is the dominant factor in the work by Koch and Haug. Both models are analyzed including the local field effect. It is shown that the validity of each model depends very much upon the parameters involved. A similar analysis is also given for CuCl where the biexcitons are important. It was found that the local field correction is not important in this case. The contribution of the exciton and biexciton interaction, however, can be important and should be included in the calculation of OB given by Haug. B.W.

N84-24429# Consiglio Nazionale delle Ricerche, Rome (Italy). Ist. de Fisica Atomica e Molecolare.
CRITICAL SLOWING-DOWN IN MICROWAVE ABSORPTIVE BISTABILITY Abstract Only
A. Gozzini (Pisa Univ.), F. Maccarrone (Pisa Univ.), S. Barbarino (Pisa Univ.), I. Longo, and R. Stampacchia *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

In this experiment one utilizes a microwave confocal open resonator in the transmission configuration, having a Q factor of 10 to the 5th power. The resonator is filled with ammonia gas at the pressure of 1 mTorr. A klystron oscillator, frequency stabilized on the 3-3 ammonia inversion line, feeds the resonator which is tuned at the same frequency. In these experimental conditions, if the input power P sub I is continuously increased from a low to a sufficiently high value, the output power changes abruptly from a low to a high value. For a fixed gas pressure, this change occurs at a fixed threshold input power P sub up. The same occurs if the input power is continuously decreased from a high value; in this case one has P sub down < P sub up, P sub down being the threshold power at which the system switches from the high

to the low transmission state. This effect, called critical slowing-down, is observed also in the downward transition, when the input power is suddenly changed from a high value to P sub I = P sub down delta P. A theoretical approach to this phenomenon may be given, in which the behavior of the system is described writing two differential equations. B.W.

N84-24430# Warsaw Univ. (Poland). Inst. of Theoretical Physics.
ABSORPTIVE OPTICAL BISTABILITY WITH LASER AMPLITUDE FLUCTUATIONS Abstract Only **c36**
M. Kus, K. Wodkiewicz, and J. A. C. Gallas (Max-Planck-Inst. of Quantum Optics) *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 1p (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/5

In this paper the influence of laser fluctuations on the hysteresis cycle in Optical Bistability is discussed. For the simplest case of an Absorptive Optical Bistability in a good cavity driven by an external laser light with non-white Gaussian amplitude fluctuations, a Fokker-Planck equation is derived in the limit of large laser linewidth and good amplitude stabilization. This Fokker-Planck equation has a nonconstant diffusion term which shifts the most probable values of the steady state probability distribution from its deterministic positions. From the form of the steady state solution of the Fokker-Planck equation with non-white amplitude fluctuations the relative stability of the bistable branches is discussed. As in the case of quantum fluctuations the random amplitude of the laser field leads to a small range of values of the injected laser intensity in which the two bistable peaks have a comparable area. The transmitted field averaged with respect to the stationary distribution function coincides with one of the two deterministic branches except on the narrow transition region where there are large fluctuations. B.W.

N84-24431# Pisa Univ. (Italy). Gruppa Nazionale di Struttura della Materia.
PRECISE MEASUREMENTS OF BISTABILITY IN A CO/SUB 2 LASER WITH INTRACAVITY SATURABLE ABSORBER **c36**
E. Arimondo, B. M. Dinelli, and E. Menchi *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/5

Optical bistability in a laser with an intracavity saturable absorber is a phenomenon theoretically investigated firstly by Lugiato. The experimental observations in CO2 lasers have provided clear evidence of the bistability phenomenon and shown that the absorber parameters could be determined from these observations. In this work a quantitative comparison between a theoretical description of optical bistability and the experimental results is presented for the first time. The parameters defining the laser cavity and the CO2 amplifying medium were measured carefully, and the bistability was observed and analyzed quantitatively as a function of the laser parameters. B.W.

N84-24432# Korean Inst. of Science and Technology, Seoul. Dept. of Electrical Engineering.
PERIODIC WINDOW, PERIOD DOUBLING, AND CHAOS IN A LIQUID CRYSTAL BISTABLE OPTICAL DEVICE
Jae-Won Song, Hai-Young Lee, Sang-Yung Shin, and Young-Se Kwon *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 6p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

A twisted nematic liquid crystal (TNLC) bistable optical device is constructed to study the Feigenbaum scenario. The simple transmission, having a single near-trapezoidal hump and a non-negligible extinction level, facilitates experimental observation and computer simulation. A number of periodic windows, i.e., 3, 4, 5, and 7T (T means a period), have been easily observed as well as period doublings up to 4T and chaos. It was also confirmed that these waveforms have the universal-sequence patterns. Based on a simple broken-linear modelling of the TULC modulator transmission characteristics, the computer simulation has been performed to show period doublings, periodic windows, and period mergings. It exhibits reasonably good agreement with the experiment, and explains easy observation of periodic windows. B.W.

N84-24433# Milan Univ. (Italy). Dipt. de Fisica.
EFFECTS OF THE RADIAL VARIATION OF THE ELECTRIC FIELD ON SOME INSTABILITIES IN LASERS AND IN OPTICAL BISTABILITY Abstract Only **c36**
L. A. Lugiato and M. Milani *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/5

Under proper conditions the stationary state of a homogenously broadened, single mode ring laser can become unstable. The instability requires a bad cavity situation. It was found that self-pulsing behavior in good cavity conditions occurs in optical bistability in a ring cavity filled with a homogeneously broadened atomic sample. In this paper, it is assumed that the electric field has the radial profile of the TEM sub oo mode of a ring cavity with spherical mirrors. In the case of optical bistability, it is assumed that the incident field also corresponds to the TEM sub oo mode. A hypotheses is introduced that (1) the absorption parameter alpha L, with L = length of the atomic sample, and the mirror transmissivity coefficient T are both small, with C = alpha L/2T arbitrary, (2) the Fresnel number F = pi w(2) sub o/lambda sub o L, where w sub o is the beam waist and lambda sub o the wavelength, is large, (3) the atomic system is two-level and homogeneously broadened. In the case that the transverse dimension d of the atomic sample is much smaller than the beam waist w sub o so that only the central part of the beam interacts with the atoms. B.W.

N84-24434# Lockheed Missiles and Space Co., Palo Alto, Calif. Quantum Optics Group.
THEORY OF OPTICAL BISTABILITY IN COLLINEAR DEGENERATE FOUR-WAVE MIXING Abstract Only **c74**
Richard Lytel *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

Optical bistability occurs in many all-optical devices with non-linear couplings and feedback mechanisms. Thus, bistability is predicted for phase conjugate resonators, Fabry-Perot interferometers, and, generally wave mixing devices with a source of feedback. Bistability is therefore expected in four-wave mixing, where the Maxwell equations provide nonlinear feedback through the nonlinear susceptibility. The purpose of this paper is to present and solve a complete theory of optical bistability in collinear degenerate four-wave mixing in isotropic media. Optical bistability has been previously predicted in collinear degenerate four-wave mixing in isotropic media. This paper extends the incomplete theory of degenerate our-wave mixing in isotropic media to include all phase-matched contributions to the equations of motion for the slow-varying amplitudes. The additional non-conjugate contributions significantly alter the physics of the interactions and provide additional feedback among the various pump and signal waves. New predictions for bistability in the reflection coefficient are made and illustrated for some practical cases. B.W.

N84-24435# Brown Univ., Providence, R. I. Div. of Engineering.
A SATURABLE INTERFEROMETER THEORY OF ABSORPTIVE OPTICAL BISTABILITY **c74**
N. M. Lawandy and R. P. Willner *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

The method of summing transmitted waves routinely is used to analyze interferometer structures to develop an OB equation. The method yields a different state equation than the usual mean-field model. However, for small C values and or lage input intensities a Taylor expansion of our state equation yields the mean field pure absorptive OB equation. This equation also gives a different condition for hysteresis. The system was interrogated

after any given number of round trips via the analytic expression for the sum at that point due to the simplicity of this approach. Using these expressions, switching times for both the up and down processes are given. B.W.

N84-24436# Rome Univ. (Italy). Ist. di Fisica-Facolta di Ingegneria.
BISTABILITY IN OPTICAL WAVEGUIDES Abstract Only c74
C. Sibilia and M. Bertolotti *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 1p ref (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

Using a treatment due to Bendow, Gianino and Tzoar in which the electric field of a CW gaussian beam in a nonlinear waveguide is given utilizing the paraxial approximation, it is shown that a bistable behavior can occur in a cylindrically symmetric nonlinear waveguide in which the dielectric constant has a parabolic behavior in the radial direction. The treatment uses Bendow et al.'s method of expansion of the electric field in a set of quasinonlinear modes of the guide obtained within the spirit of paraxial approximation. It is shown that at each chosen length of the waveguide it is possible, in general, to find a set of waveguide parameters which give rise to a bistable behavior in the light intensity coming out at that section. B.W.

N84-24437# Royal Signals and Radar Establishment, Malvern (England).
NON-LINEAR FABRY-PEROT TRANSMISSION IN A CdHgTe ETALON
G. Parry, J. R. Hill, and A. Miller *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

The study of large nonlinear refractive effects in cadmium mercury telluride is extended to investigate the transmission characteristics of an etalon. B.W.

N84-24438# Essen Univ. (West Germany). Fachbereich Physik.
SELF-PULSING AND CHAOS IN INHOMOGENEOUSLY BROADENED SINGLE-MODE LASERS c36
R. Graham and Y. Cho (Osaka Univ.) *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

Self-pulsing and chaos in inhomogeneously broadened single mode lasers is investigated in the framework of two models with 4 and 6 deg of freedom, respectively. The results of a linear stability of the time-independent states and some numerical solutions are given to show the various types of dynamical behavior which may occur in these models. B.W.

N84-24439# Akademiya Nauk BSSR, Minsk. Inst. of Physics.
SELFPULSING, HYSTERESIS AND CHAOS IN A STANDING WAVE LASER c36
L. A. Kotomtseva, N. A. Loiko, and A. M. Samson *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

Conditions for self-pulsing, hysteresis, and three types of chaotic behavior considering the gain and losses longitudinal structure in a standing-wave laser as a dynamic system are considered theoretically. Author

N84-24440# Zurich Univ. (Switzerland). Physik-Inst.
THE NMR LASER: A NONLINEAR SOLID STATE SYSTEM SHOWING CHAOS Abstract Only c36
E. Brun, B. Derighetti, R. Holzner, and D. Meier *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 1p (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/5

Several novel experimental observations and corresponding theoretical considerations are discussed for a system of strongly polarized nuclear spins in a solid which is placed inside the tuned coil of an NMR detector such that self-induced laser activity sets in. B.W.

N84-24441# Arizona Univ., Tucson. Optical Sciences Center.
OPTICAL NONLINEARITY AND BISTABILITY DUE TO THE BIEXCITON TWO-PHOTON RESONANCE IN CuCl
N. Peyghambarian, D. Sarid, and H. M. Gibbs *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs Sponsored in part by NSF, AFOSR and ARO (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

It is shown that, unlike the previous prediction that a 1-micron CuCl slab can be switched on with 0.1 MW square centimeters with uncoated surfaces, bistability can be obtained only with a high reflection coating of the Fabry-Perot etalon for approximately 10-micron samples, and with intensities on the order of 10 MW/square centimeters. R.J.F.

N84-24442# Manchester Coll. of Science and Technology (England). Dept. of Mathematics.
OPTICAL EXTINCTION THEOREM THEORY OF OPTICAL MULTI-STABILITY BIFURCATIONS AND TURBULENCE IN THE FABRY-PEROT INTERFEROMETER Abstract Only c74
R. K. Bullough, S. S. Hassan (Ain Shams Univ.), G. P. Hildred, and R. R. Puri *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

Optical extinction theorem theory of optical multi-stability bifurcations and turbulence in the Fabry-Perot interferometer is reviewed strictly within the context of the theory of optical bistability and optical multistability. The concern was to connect the envelope Maxwell-Bloch equations with optical bistability (multistability) in a Fabry-Perot (FP) cavity in a rigorous and potentially quantitative way. One problem in this connection is an adequate statement about standing waves. Methods are presented which derive the standing wave equations of motion completely as a part of a comprehensive non-linear refractive index theory of multistability inside the FP cavity. The theory is a c-number one - but a comparable quantum theory seems possible. A key feature of the argument is generalisation of the famous 'optical extinction theorem' to this non-linear regime. In practice it means that no boundary conditions are invoked at the surfaces of the FP cavity - only conditions at infinity - and this offers advantages for the quantitative description that is shown. R.J.F.

N84-24443# Manchester Coll. of Science and Technology (England).
OPTICAL BISTABILITY FROM THE DICKE MODEL c74
R. R. Puri, G. P. Hildred, S. S. Hassan (Ain Shams Univ.), and R. K. Bullough *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

It is concluded from a strictly quantal model coupled to a cavity that quantum fluctuations and cavity feed back are together sufficient for optical bistability but that either separately is not. R.J.F.

N84-24444# Bell Telephone Labs., Inc., Holmdel, N. J.
CONSIDERATIONS INVOLVED IN THE DESIGN OF AN OPTICAL DIGITAL COMPUTER Abstract Only c60
Alan Huang *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 09/2

An optical finite-state machine is used to illustrate how the parallelism and noninterfering propagation of optics can give optical bistability an edge over other switching technologies. Considerations involved in the design of an optical digital computer are discussed. Optical bistability and its advantages of parallelism of optics and non-interfering propagation are discussed. Interconnection bandwidth and Von Neuman bottleneck are discussed. R.J.F.

N84-24445# Otago Univ., Dunedin (New Zealand). Dept. of Physics.
POLARIZATION SWITCHING WITH SODIUM VAPOUR Abstract Only
M. W. Hamilton and W. J. Sandle *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

Results are given of an experiment which demonstrates switching of the polarization state of the output of a near-concentric Fabry-Perot containing sodium vapour, excited via the homogeneously broadened DI transition. An example of the output, for linearly polarized laser input, at 1.5 GHz below line center shows switching with hysteresis at high input power (approximately 400 mW) due to saturation, as well as the switching at lower power (approximately mW) due to optical pumping effects. Purely absorptive polarization switching at approximately 50 mW input power was observed. Polarization switching has been predicted in the context of three state atoms in an optical cavity, and the lower power switchin has been previously observed using the inhomogeneously broadened DI transition of sodium in a Fabry-Perot with the laser detuned above line center. By using argon buffer gas at up to 100 torr, importance of hyperfine structure and inhomogeneous broadening was reduced so as to make the transition approximate a J = 1/2 to J = one half transition. R.J.F.

N84-24446# Arizona Univ., Tucson. Optical Sciences Center.
TRANSVERSE SOLITARY WAVES IN A DISPERSIVE RING BISTABILITY CAVITY CONTAINING A SATURABLE NONLINEARITY Abstract Only
J. V. Moloney, A. C. Newell, and D. W. McLaughlin *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p ref (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

A soliton theory was developed which replaces the complicated numerical problem of solving both the nonlinear partial differential equation (propagation) and eqn(2) over many hundreds of cavity roundtrips by a solution of two ordinary differential equations and a few simple projections of the resulting solutions. Quantitative predictions can be made for the shapes, widths and heights of the stationary soliton trains. The prediction of the theory is exact for a single soliton appearing on the upper branch in the bistable region. R.J.F.

N84-24447# Heriott-Watt Univ., Edinburgh (Scotland). Dept. of Physics.
OBSERVATION OF OPTICAL HYSTERESIS IN AN ALL-OPTICAL PASSIVE RING CAVITY Abstract Only **c74**
R. G. Harrison, C. Emshary, and I. Al-Saidi *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

The first observation of dispersive optical hysteresis in an all optical passive uni-directional ring cavity system is reported. Ammonia gas is used as the non-linear medium for which a number of vibrational-rotational transitions are in near coincidence with the step tunable emission from a TEA CO2 laser. Pronounced instabilities and optical hysteresis are found to occur over a gas pressure range commensurate with that for self-focussing. A grating tunable hybrid TEA CO2 laser with amplifier, operating on a single mode, with a gain switched pulse duration of approximately 10 nsec was used. The temporal features of the cavity signal was sensitive to gas pressure. Outside the pressure range for instabilities (and self focussing) the ring signal exhibited a smooth temporal form similar to that of the incident signal. Cavity blocking and cavity misalignment checks unambiguously identified these nonlinear effects to be due to cavity feedback. Hysteresis associated with optical bistability is clearly evident for an NH3 pressure of 10 torr. R.J.F.

N84-24448# Brussels Univ. (Belgium). Service de Chimie-Physique II.
ABSORPTIVE OPTICAL BISTABILITY IN A BAD CAVITY Abstract Only
Paul Mandel and T. Erneux (Northwestern Univ.) *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

In a theoretical discussion of optical bistability, it is often necessary to resort to some approximation scheme to discuss time dependent properties. The standard method consists in assuming a very good cavity or a very bad cavity and to perform an adiabatic elimination of the fast varying variables. It is shown that when all three decay constants are of the same order of magnitude, an adiabatic elimination of fast variables can nevertheless be performed in the limit of large C (fully developed hysteresis). The four domains are considered, each centered around one of the four particular points of coordinates (YsubM, XsubM), YsubF, ZsubM), (YsubM,XsubM), and (YsubM,ZsubM). In each domain all stationary field and atomic functions have a well defined dependence on C. Time dependent solutions which have the same scaling are sought. Second, in each domain a multiple time perturbation expansion is performed after the scaling laws are applied. As a result, in the two domains pertaining to the lower branch, a closed nonlinear differential equation for the population inversion which is closely related to the equation derived is obtained. R.J.F.

N84-24449# Technische Univ., Hanover (West Germany). Inst. fuer Quantenoptik.
CRITICAL SLOWING DOWN AND MAGNETICALLY-INDUCED SELF-PULSING IN A SODIUM-FILLED FABRY-PEROT RESONATOR Abstract Only
J. Mlynek, F. Mitschke, and W. Lange *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

The observation of critical slowing down and of self pulsing in a Fabry-Perot resonator (FP) filled with sodium atoms under conditions of transverse optical pumping is discussed. The dye laser, optically isolated from the FP by means of a Faraday rotator is detuned from the Na D1 line by 10 to 20 GHz. The sodium sample is placed in a near confocal Fabry-Perot and can be subjected to a transverse magnetic field. The intensity of the laser beam can be switched by means of an electro-optic modulator, thus providing input steps of variable height. A polarizer is used to either circularly or linearly polarize the input beam. The right and left circular polarization components of the resonator output beam can be separated by means of lambda/4-plate and a polarizing beam splitter. A pair of photodiodes is used for detection. With circularly polarized input light, optical bistability can be detected by one of the photodiodes. R.J.F.

N84-24450# Academy of Sciences of the Ukrainian SSR, Kiev (USSR). Inst. of Physics.
OPTICAL BISTABILITY AND HYSTERESIS UNDER PHASE CONJUGATION IN CdS CRYSTAL Abstract Only **c64**
M. S. Brodin, A. A. Borshch, V. I. Volkov, and N. V. Kukhtarev *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 12/1

The results of theoretical and experimental investigation of the optical hysteresis in phase conjugation under degenerate six photon mixing in CdS crystal are presented. The exact solution of the nonlinear equations, describing phase conjugation (PC) was obtained. Theoretical dependence of the backward wave intensity on that of interacting waves with Gaussian time shape exhibits well pronounced hysteresis, which causes the bistable operation when total pump intensity exceeds some critical value I sub cr. Several hysteresis loops are expected to appear with further increase of pumping. The experiments were performed on CdS crystal in four wave mixing configuration at room temperature with ruby laser. The onset of bistability was observed at pump intensity above 20MW square centimeters. The modulation of PC intensity due to optical hysteresis was observed. The PC in CdS crystal is due to fifth order nonlinear susceptibility. This nonlinearity

arises from nonequilibrium free carriers excited by interband two quantum absorption. R.J.F.

N84-24451# GTE Labs., Inc., Waltham, Mass.
LOW POWER OPTICAL BISTABILITY NEAR BOUND EXCITONS IN CADMIUM SULFIDE **c74**
M. Dagenais and H. Winful *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

Using a two level representation for modeling the material inside a Fabry-Perot resonator, and assuming reasonable physical parameters, it is shown that one needs to saturate the transition in order to see optical bistability. This implies that one cannot expect to switch off much faster than the two level energy relaxation time, given that the cavity build up time is sufficiently short. On the basis of such a model, a turn off time from the on state of the order of 500 psec is predicted if, of course, thermal effects can be completely eliminated. In conclusion, optical bistability near a bound exciton in cadmium sulfide can be seen at very low power. Furthemore, this system promises very fast switching and very fast all optical processing of signals. R.J.F.

N84-24452# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
LIGHT-INDUCED NONRECIPROCITY: DIRECTIONAL OPTICAL BISTABILITY; SPECTROSCOPY OF INDUCED ANISOTROPY; NONLINEAR SAGNAC EFFECT Abstract Only **c36**
A. E. Kaplan *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/5

It is shown that the effect of nonlinear nonreciprocity is directly related to the anisotropic properties of the third order nonlinear susceptibility. Therefore, it must be extremely sensitive to the mutual arrangement of polarization of both of the counter propagating waves. In the case of abitrary third order nonlinear tensor, the induced anisotropic response of the matter can be expressed as equations that, based on Maxwell equations and Eq(3), have four invariants which allow for some mutual eigen polarizations to propagate without distortion of their initial directions of polarization. Both of the beams are linearly polarized, with their electric vectors either (1) parallel to each other or (2) orthogonal to each other; both of the beams are circularly polarized being either (3) corotating or (4) counterrotating. All of those eigen polarizations have different respective magnitudes of nonlinear nonreciprocity. For instance, the ratio of pertinent nonlinear nonreciprocities for these configurations in the case of pure Kerr-effect is 1:(3/4):(1/4):(1/4):(3/2). Therefore, the proposed effect can be used as a novel experimental tool for the spectroscopy of the anisotropic components of the third order nonlinear tensor of matter. R.J.F.

N84-24453# Akademiya Nauk BSSR, Minsk. Inst. of Physics.
VACUUM-DEPOSITED THIN-FILM INTERFEROMETERS AS BISTABLE DEVICES OPERATING CONTINUOUSLY AT ROOM TEMPERATURE Abstract Only **c35**
S. F. Apanasevich, F. V. Karpushko, and G. V. Sinitsyn *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 14/2

Nonlinear thin film interferometers as bistable devices have the advantage of operating at room temperature. A prolonged effect of the input light beam on ZnS interferometers does not cause any changes resulting in a decrease in light induced photorefraction, and this bistable element can remain in any of its stable states until the switching signal appears. In nonlinear thin film interference filters with ZnSe and Na3AlF6 spacers, the switching of the input intensity is first followed by a short term (a few seconds) transient after which operation of the bistable device stabilizes. In all the thin film interferometers studied, the beam profile hysteresis and an unusual form of the hysteresis loop with the negative slope of the upper branch for the on axis zone of the input beam were observed. The decrease in the output intensity as the input intensity increases after the bistable device is switched on is likely to be determined by the difference between the stationary spatial profile of the light field distribution inside the interferometer and the temperature distribution profile. R.J.F.

N84-24454# Academy of Sciences of the Ukrainian SSR, Kiev (USSR). Inst. of Physics.
MULTISTABILITY DUE TO THE HELICAL OPTICAL DISTRIBUTED FEEDBACK IN THE CHOLESTERIC LIQUID CRYSTALS Abstract Only
N. V. Kukhtarev *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 1p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

It is shown that optical helical distributed feedback may cause the appearance of the multistability in transmission and reflection of the laser light by the cholesteric liquid crystal (CLC) show that multistability may be realized with the intensities 1 kW/square centimeters with response time of 10 to the minus 9th power. R.J.F.

N84-24455# California Inst. of Tech., Pasadena.
BISTABLE INJECTION LASERS **c36**
C. Harder, K. Y. Lau, and A. Yariv *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 4p refs Sponsored in part by ONR, NSF and ARO (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/5

A simple model is given which explains the main features of an injection laser with inhomogeneous current injection. A set of three rate equations is used, one for the density of the carriers in the gain section, one for those in absorbing section and one for the density of photons in the lasing mode. Experimental results of this device placed in an external optical cavity are also reported. Depending on the biasing condition the device will be bistable or pulsating. In the bistable mode the laser can be switched on and off by varying the amount of optical feedback and it can be used as an optical stylus to read an optical disk. In the pulsating mode ultrashort pulses through passive mode locking can be generated at a repetition rate corresponding to the round trip in the external optical cavity. R.J.F.

N84-24456# Pasteur (Louis) Univ., Strasbourg (West Germany). Lab. de Spectroscopie et D'Optique du Corps Solide.
OPTICAL BISTABILITY IN CuCl Abstract Only **c26**
B. Honerlage, J. Y. Bigot, and R. Levy *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

In CuCl, two photon absorption to biexciton state gives rise to renormalization of the dielectric function that leads to optical bistability with last commutation time. Author

N84-24457# Max-Planck-Institut fuer Quantenoptik, Garching (West Germany).
RADIATION PRESSURE INDUCED OPTICAL BISTABILITY Abstract Only **c74**
A. Dorsel (Munich Univ.), P. Meystre, E. Vignes, and H. Walther (Munich Univ.) *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 3p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/6

Optical bistability without nonlinear medium can be achieved by using the effect of radiation pressure on a mirror. A detailed time dependent analysis of this system, its experimental verification, and possible applications, are discussed. R.J.F.

N84-24458# North Carolina State Univ., Raleigh. Dept. of Materials Engineering.
FUNDAMENTAL STUDIES OF GROWTH, DOPING AND TRANSFORMATION IN BETA SILICON CARBIDE Annual Technical Report, 1 Sep. 1982 - 31 Aug. 1983

R. F. Davis 31 Aug. 1983 14057 p
(Contract N00014-79-C-0121)
(AD-A139179; NCSU-243-043-003) Avail: NTIS HC A04/MF A01 CSCL 20/2

Semiconductor quality beta-SiC thin films are currently being grown for future microelectric applications using CVD techniques. Research in this period has included initial ion implantation studies coupled with annealing and ion microprobe analyses of the resulting implant profiles. An indepth study of the converted layer formed by the reaction of C2H4 with the Si substrate is also included in this report. Author (GRA)

N84-24459# North Texas State Univ., Denton. Center for Applied Quantum Electronics.
INVESTIGATION OF NONLINEAR OPTICAL PROPERTIES OF SEMICONDUCTORS Final Report
D. G. Seiler 23 Feb. 1984 14137 p
(Contract N00014-82-C-0545)
(AD-A139227; AD-E900330) Avail: NTIS HC A07/MF A01 CSCL 20/12

Nonlinear optics is an increasingly interesting and exciting area of physics. Many nonlinear optical effects have been discovered and various nonlinear optical devices constructed from a wide variety of materials. In particular, small band gap semiconductors like InSb can have unique optical properties because of their small effective masses and direct band gaps. Unusual and often unexpected results are found in their nonlinear behavior--optical bistability, nonlinear refraction, laser pulse limiting and shaping effects, optical transistor action, etc. These effects can be described in terms of a third order susceptibility and are associated with the creation of free carriers by the light. The creation of even a small number of free electrons or holes can strongly effect the 'dynamic' nonlinear optical properties of the material. In this project we used sensitive photoelectronic methods to investigate the nonlinear generation of electrons in InSb, CdS, and GaAs induced by two-photon absorption of light. A wide variety of photoelectronic effects are initiated by the creation of free carriers from the absorption of light in a semiconductor or insulator. These include the photo-Hall effect, photoconductivity, recombination, trapping, lifetimes, all of which are important for understanding devices such as light detectors, light emitters, or energy converters. GRA

N84-24460# Rockwell International Corp., Thousand Oaks, Calif. Science Center.
TEMPERATURE-COMPENSATED PIEZOELECTRIC MATERIALS Semiannual Report, 6 Jun. - 30 Nov. 1978
R. R. Neurgaonkar and L. E. Cross Jan. 1979 28 p
(Contract F49260-78-C-0093; ARPA Order 3570)
(AD-A139279; SC5162.2SA; SAR-1) Avail: NTIS HC A03/MF A01 CSCL 20/2

During the first and second quarters of the present contract, an initial literature survey of all known tungsten-bronze compounds was completed. Preliminary formulation of the Gibb's energy function for ferroic materials to describe the phase transitions has been accomplished. Apparatus to perform LPE growth of tungsten-bronzes has been constructed and several suitable flux systems for the growth of strontium-barium-niobate (SBN) films have been found. From an analysis of the chemistry of SBN, several new compounds have been identified and may be readily obtained by element substitutions within the SBN structure. Author (GRA)

N84-24461# Rockwell International Science Center, Thousand Oaks, Calif. Science Center.
ION IMPLANTED GaAs IC. PROCESS TECHNOLOGY Quarterly Technical Report, 1 Sep. - 30 Nov. 1978
R. Zucca, F. H. Eisen, R. C. Eden, D. R. Chen, and B. M. Welch Mar. 1979 50 p Prepared in cooperation with Crystal Specialties Inc., California Inst. of Tech. and Cornell Univ.
(Contract F49620-77-C-0087; ARPA Order 3384)
(AD-A139348; SC5110.14QR; QTR-6) Avail: NTIS HC A03/MF A01 CSCL 20/12

This report covers the first quarter, Phase 2 of a program on ion implanted planar GaAs integrated circuit technology. The overall objective of this program is the development of a manufacturable process for high-speed low-power GaAs logic circuits. The goal for Phase 1 was to establish the technology, and demonstrate its viability by fabricating circuits reaching MSI complexity. The goal for Phase 2 is to achieve the capability of fabricating GaAs ICs of LSI complexity. The program involves the Rockwell International Science Center and three subcontractors; Crystal Specialties Inc., California Institute of Technology and Cornell University. The most important result obtained in this quarter is the verification of proper operation of an 8-channel multiplexer. This multiplexer, employing 64 gates, is the most complex GaAs IC built to date. The first multiplexer results show operation at moderate speed, 254 MHz clock rate with low power dissipation, 80 mW, for the entire circuit. Testing of wafers which are expected to demonstrate operation at higher speed is in progress. GRA

N84-24462# Geoscience, Ltd., Solana Beach, Calif.
THERMAL PROPERTY MEASUREMENT TECHNIQUES AND SOME RESULTS FOR CdTe AND (Hg,Cd)Te ALLOYS Final Technical Report, 10 Mar. 1983 - 29 Feb. 1984
H. F. Poppendiek, D. J. Connelly, C. M. Sabin, and A. L. Gioia 29 Feb. 1984 34 p
(Contract MDA903-83-C-0156; ARPA Order 4733)
(AD-A139375; GLR-244) Avail: NTIS HC A03/MF A01 CSCL 20/12

In order to improve the manufacturing techniques for semiconductor materials as well as establishing the operating performance characteristics, the thermophysical properties, thermal conductivity, specific heat, expansion coefficient, emissivity and heat of fusion are required. Some of these properties have been measured for CdTe and (Hg,Cd)Te. In addition to these results, measurement techniques are also described. Author (GRA)

N84-24463# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
SOLITON PROPAGATION IN ONE-DIMENSIONAL ORGANIC CONDUCTORS Final Report
T. W. Barrett Sep. 1983 94 p
(AD-A139386; NADC-83074-60) Avail: NTIS HC A05/MF A01 CSCL 12/1

Criteria are stated for the existence of solitons in one-dimensional organic conductors, particularly trans polyacetylene. All physical situations considered are described in terms of a classical anharmonic oscillator moving in an anharmonic double potential well. As the solition is known to exist in the line of pendula joined with elastic coupling and also in the long Josephson junction in the form of the fluxon, the theoretical position is taken that if, indeed, the soljton exists in polymers, whether of the vibrational or the charge-domain-wall-type, then it should conform to certain established criteria of behavior already rigorously studied in the aforementioned situations. In order to understand the dynamics of a conducting one-dimensional system, whether or charge or mechanical energy, a microscopic parametric excitation model formalism must be adopted. On the other hand, in order for this model to be related to physical measurements such as that of current and voltage, a microscopic formalism (the Hubbard model) must also be achieved. Both pictures have advantages and disadvantages. However, both pictures are necessary for complete understanding. GRA

N84-24464# Technische Hochschule, Darmstadt (West Germany). Inst. fuer Hochfrequenztechnik.
MICRO-REACTIONS OF METAL CONTACTS ON VARIOUS TYPES OF GaAs SURFACES Annual Technical Report, Jan. 1983 - Jan. 1984
H. L. Hartnagel, E. Huber, K. H. Kretschmer, K. Roehkel, and J. Wuerfl Jan. 1984 80 p
(Contract DAJA45-83-C-0012)
(AD-A139412; ATR-1) Avail: NTIS HC A05/MF A01 CSCL 07/4

An XPS and ISS analysis of a range of GaAs surfaces is reported which are produced by various technological steps such

as etching in basic or acidic solutions as costumary before the deposition of metals. Studies on the light emission for reverse biassed Schottky contacts has resulted in a better understanding of the influence of preevaporation etchants on this emission. First results of lateral material transport between co-planar electrodes and on Metal-GaAs interdiffusion due to typical operational device conditions are presented. Author (GRA)

N84-24465# Washington Univ., St. Louis, Mo. Semiconductor Research Lab.
IMPURITY AND DEFECT INTERACTIONS IN GaAs Final Technical Report, 1 Aug. 1980 - 31 Dec. 1983
C. M. Wolfe, P. A. Fedders, J. H. Burgess, G. E. Stillman, and C. M. L. Yee 29 Feb. 1984 178 p
(Contract N00014-80-C-0762; RR0-2102)
(AD-A139592; WU/SRL-64422-22) Avail: NTIS HC A09/MF A01 CSCL 20/12

This work was initiated to examine interactions among impurities and defects in GaAs which produce problems in the fabrication of high-speed integrated circuits. For this purpose various aspects of impurity and defect identification, interaction, redistribution, incorporation, and carrier scattering were investigated. Author (GRA)

N84-24466# Sandia Labs., Albuquerque, N. Mex.
OBSERVATIONS OF DAMAGE AND TRANSPORT OF HYDROGEN IN ION BOMBARDED POLYCRYSTALLINE SILICON
D. J. Sharp, J. K. G. Panitz, and C. H. Seager 1984 12 p refs Presented at Mater. Res. Soc. Spring Meeting, Albuquerque, N. Mex., 27 Feb. 1984
(Contract DE-AC04-76DP-00789)
(DE84-008035; SAND-84-1074C; CONF-840258-1) Avail: NTIS HC A02/MF A01

A combination of chemical etching and sheet resistivity measurements showed that intense (1.4 mA/sq cm) low energy (1400 eV) ion beam hydrogenation of polycrystalline silicon having a columnar structure produces electrical defect passivation to depths on the order of 100 microns. Transmission electron micrographs disclose surface and near surface features resulting from the ion beam bombardment which suggest that one of the hydrogen transport mechanisms may be defect induced. DOE

N84-24467# Virginia Univ., Charlottesville. Dept. of Physics.
MAGNETIC IMPURITIES IN SUPERCONDUCTORS Progress Report, 1 Aug. 1983 - 30 Jun. 1984
J. Ruvalds 1984 39 p refs
(Contract DE-AS05-81ER-10959)
(DE84-007871; DOE/ER-10959/3) Avail: NTIS HC A03/MF A01

Progress is reported on the following studies: (1) resistivity from magnetic impurity pairs in magnetic alloys, (2) magnetic interactions and impurity susceptibility in spin-glass alloys, (3) spin susceptibility of a superconductor, (4) charge density wave conductivity, and (5) spin susceptibility and critical field of a superconductor containing magnetic impurities. DOE

N84-24468# Argonne National Lab., Ill.
ION-INDUCED SURFACE MODIFICATION OF ALLOYS
H. Wiedersich Nov. 1983 13 p refs Presented at the Materials Research Society Ann. Meeting, Boston, 14-17 Nov. 1983
(Contract W-31-109-eng-38)
(DE84-006664; CONF-831174-76) Avail: NTIS HC A02/MF A01

A considerable number of processes can affect the composition of an alloy in the surface region during ion bombardment in addition to the accumulation of the implanted species. Collisions of energetic ions with atoms of the alloy induce local rearrangement of atoms by displacements, replacement sequences, and by spontaneous migration and recombination of defects within cascades. Point defects form clusters, voids, dislocation loops, and networks. Preferential sputtering of elements changes the composition of the surface. At temperatures sufficient for thermal migration of point defects, radiation enhanced diffusion promotes alloy component redistribution within and beyond the damage layer. Fluxes of interstitials and vacancies toward the surface and into the interior of the target induce fluxes of alloying elements leading to depth dependent compositional changes. Moreover, Gibbsian surface segregation may affect the preferential loss of alloy components by sputtering when the kinetics of equilibration of the surface composition becomes competitive with the sputtering rate. Temperature, time, current density, and ion energy can be used to influence the individual processes contributing to compositional changes and thus produce a rich variety of composition profiles near surfaces. DOE

N84-24469# Argonne National Lab., Ill. Materials Science and Technology Div.
ROLE OF SCHOTTKY DISORDER ON THE STABILITY AND STRUCTURE OF (100) TWIST GRAIN BOUNDARIES IN NiO
D. Wolf Jan. 1984 8 p refs Presented at the Mater. Res. Soc. Ann. Meeting, Boston, 14-17 Nov. 1983
(Contract W-31-109-eng-38)
(DE84-006447; CONF-831174-74) Avail: NTIS HC A02/MF A01

Recent calculations on (100) coincidence-site lattice (CSL) twist boundaries in the NaCl structure showed that without point defects these boundaries are only marginally stable. Following an earlier suggestion that point defects are the likely source for the considerable stability of these boundaries observed experimentally for MgO and NiO, Tasker and Duffy showed recently that the creation of a Schottky pair can, indeed, stabilize a (100) twist boundary in NiO. A variety of configurations in which one or more Schottky pairs were created in the perfect coincidence-site lattice (CSL) or anti-CSL unit cell are investigated. It is concluded that many metastable structures may exist which differ mainly with respect to their different interfacial mass densities and the relative translation of the two halves of the bicrystal. DOE

N84-24470# Brookhaven National Lab., Upton, N. Y. Div. of Metallurgy and Materials Science.
LOW TEMPERATURE (150 TO 250(0)C) DEPOSITION OF n(+) AND p(+) MICROCRYSTALLINE SILICON FOR VLSI DEVICE CONTACTS
G. Rajeswaran, P. E. Vanier, F. J. Kampas, and R. R. Corderman 1983 8 p refs Presented at the Mater. Res. Soc. Ann. Meeting, Boston, 14-17 Nov. 1983
(Contract DE-AC02-76CH-00016)
(DE84-006474; BNL-34122; CONF-831174-72) Avail: NTIS HC A02/MF A01

The RF glow discharge decomposition of dilute mixtures (approx. 1%) of SiH4 in H2, with suitable doping agents such as PH3 or B2H6 added, produces n(+) and p(+) microcrystalline ((MU)c) silicon films with resistivities (rho) in the 10(-1) OMEGA.cm range at exceedingly low substrate temperatures T/sub s/ (150 to 250(0)C). The (MU)c-Si films consist of two phases with crystalline clusters embedded in an amorphous matrix. The films are stable when temperature cycled in the 30 to 400(0)C range and the resistivity decreases when annealed above the original deposition temperature. A model of microcrystalline film growth involving reactions between the gas phase radicals and the growing film surface is proposed. DOE

N84-24471# California Univ., Berkeley. Lawrence Berkeley Lab.
DEVELOPMENT OF NEUTRON-TRANSMUTATION-DOPED GERMANIUM BOLOMETER MATERIAL M.S. Thesis
Nicholas Paul Palaio Aug. 1983 62 p refs
(Contract DE-AC03-76SF-00098)
(DE84-008248; LBL-16695) Avail: NTIS HC A04/MF A01

The behavior of lattice defects generated as a result of the neutron transmutation doping of germanium was studied as a function of annealing conditions using deep level transient spectroscopy (DLTS) and mobility measurements. DLTS and variable temperature Hall effect were also used to measure the activation of dopant impurities formed during the transmutation process. In addition, a semiautomated method of attaching wires on to small chips of germanium (< 1 mm(3)) for the fabrication of infrared detecting bolometers was developed. Finally, several different types of junction field effect transistors were tested for noise at room and low temperature (approx. 80 K) in order to find

the optimum device available for first stage electronics in the bolometer signal amplification circuit. DOE

N84-24472# Texas Univ., Austin.
CHARGE SEPARATION ON SEMICONDUCTOR SURFACES: BASIC ASPECTS
Mary Anne Fox 1983 8 p refs Presented at the NATO Conf. on Marine Photochem., Woods Hole, Mass., 1 Sep. 1983
(Contract DE-AS05-77ER-05528)
(DE84-007214; DOE/ER-05528/66; CONF-8309214-1) Avail: NTIS HC A02/MF A01

Principles, band theory of semiconductor redox sensitization, and mechanism of photosensitized oxidations are discussed. DOE

N84-24473# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
CHEMICAL MODIFICATION OF SURFACES: THE EFFECT OF POTASSIUM ON THE CHEMISORPTION OF MOLECULES ON TRANSITION METAL CRYSTAL SURFACES Ph.D. Thesis
John Edmund Crowell Jan. 1984 287 p refs
(Contract DE-AC03-76SF-00098)
(DE84-008345; LBL-17223) Avail: NTIS HC A13/MF A01

The physical and chemical properties of pure potassium monolayers and its effect on the adsorption of oxygen, carbon monoxide and benzene on the (111) faces of platinum and rhodium single crystals are described. Potassium adsorption on both surfaces is quite similar. Potassium forms hexagonally close packed structures that are incommensurate with the substrate. The heat of desorption of potassium on these surfaces decreases with increasing potassium coverage. The surface free electron density increases and the work function decreases substantially with alkali adsorption, indicating charge transfer occurs from potassium to the substrate. Oxygen adsorption increases the potassium binding energy, and forms a surface complex at high potassium coverages. Oxygen adsorption is dissociative on both clean and potassium dosed Rh(111). The metal-oxygen stretching vibration increases in the presence of potassium, indicating stronger adsorption. Carbon monoxide adsorption on both metal surfaces is strongly affected. With increasing potassium coverage, the heat of desorption increases while the C-O stretching frequencies decrease. DOE

N84-24474# Forschungsinstitut der Deutschen Bundespost, Darmstadt (West Germany).
INVESTIGATION OF NOISE IN SILICON AVALANCHE PHOTODIODES [RAUSCHUNTERSUCHUNGEN AN SILIZIUM-LAWINEN-PHOTODIODEN BEI 850 NM]
K. Kiesel Mar. 1983 26 p refs In GERMAN; ENGLISH summary
(FI-14-TBr-11) Avail: NTIS HC A03/MF A01

Spectral noise power density was investigated on a number of silicon avalanche photodiodes. Responsivity of detectors are defined, and the noise components constituting the total noise are described. The individual components can be represented partly (exactly or otherwise) phenomenologically by formulae. The spectral noise power density is investigated as a function of different parameters and compared with calculated curves. The results for the different detectors differ only slightly. Author (ESA)

N84-24475# International Centre for Diffraction Data, Swarthmore, Pa.
STANDARD X-RAY DIFFRACTION POWER PATTERNS: SECTION 20 - DATA FOR 71 SUBSTANCES Final Report
Marlene C. Morris, Howard F. McMurdie, Eloise H. Evans, Boris Paretzkin, Harry S. Parker, Nikos P. Pyrros, and Camden Hubbard (NBS) Jan. 1984 153 p refs
(PB84-155191; NBS-MONO-25-SECT-20; LC-53-61386) Avail: NTIS HC A08/MF A01 CSCL 20B

Standard X-ray powder diffraction patterns are presented for 71 substances. These patterns, useful for identification, were obtained by manual or automated diffractometer methods or were calculated from published crystal structure data. The lattice constants from the experimental work were refined by least squares methods, and reflections were assigned Miller indices consistent with space group extinctions. Relative intensities, calculated densities, literature references, and other relevant data are included. GRA

N84-23894*# Ecole Centrale de Lyon (France). Lab. de Technologie des Surfaces.
NATURE OF THE SURFACE AND ITS EFFECT ON SOLID-STATE INTERACTIONS
J. M. Georges *In* NASA Lewis Research Center Tribology in the 80's. Vol. 1 Apr. 1984 p 45-63 refs (For primary document see N84-23891 14-37)
Avail: NTIS HC A22/MF A01 CSCL 20L

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N84-24427# Waikato Univ., Hamilton (New Zealand). Dept. of Physics.
QUANTUM THEORY OF OPTICAL EXCITONIC BISTABILITY Abstract Only
C. W. Gardiner and M. L. Steyn-Ross (York Univ.) *In* Opt. Soc. Am. Topical Meeting on Opt. Bistability 31 Jan. 1984 2p refs (For primary document see N84-24381 14-76)
Avail: NTIS HC A11/MF A01 CSCL 20/12

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N84-24476*# Howard Univ., Washington, D. C. School of Engineering.
NASA/HOWARD UNIVERSITY LARGE SPACE STRUCTURES INSTITUTE Semiannual Progress Report
Taft H. Broome, Jr. 22 Mar. 1984 254 p refs
(Grant NAG1-383)
(NASA-CR-173425; NAS 1.26:173425) Avail: NTIS HC A12/MF A01 CSCL 05I

Basic research on the engineering behavior of large space structures is presented. Methods of structural analysis, control, and optimization of large flexible systems are examined. Topics of investigation include the Load Correction Method (LCM) modeling technique, stabilization of flexible bodies by feedback control, mathematical refinement of analysis equations, optimization of the design of structural components, deployment dynamics, and the use of microprocessors in attitude and shape control of large space structures. Information on key personnel, budgeting, support plans and conferences is included. For individual titles, see N84-24477 through N84-24482. M.A.C.

N84-24477*# Howard Univ., Washington, D. C.
MEGAMECHANICS RESEARCH CONSORTIUM
Taft H. Broome, Jr. *In its* NASA/Howard Univ. Large Space Structures Inst. 22 Mar. 1984 p 28-56 (For primary document see N84-24476 14-80)
Avail: NTIS HC A12/MF A01 CSCL 05I

The mechanical behavior of large space lattice systems is investigated. Continuum modeling methods such as the Load Correction Method (LCM) and finite element operations aid in solving structural analysis problems. Static analysis of frames and trusses, dynamic analysis of trusses, analysis of thermal and mechanical loads on frames and trusses, and load corrections for three dimensional complex geometries is possible by using the LCM. The finite element method and the LCM are used to extend

Saint-Venant's principle via the Boussinesq problem into the regime of large repetitive lattice systems. M.A.C.

N84-24478*# Howard Univ., Washington, D. C. Dept. of Electrical Engineering.
STABILIZATION OF A FLEXIBLE BODY (HOOP-COLUMN) ANTENNA BY FEEDBACK CONTROL LAW
Ajit Choudhury *In its* NASA/Howard Univ. Large Space Structures Inst. 22 Mar. 1984 p 57-68 refs (For primary document see N84-24476 14-80)
Avail: NTIS HC A12/MF A01 CSCL 05I

Feedback control laws are presented for stabilization models of a hoop/column antenna. A brief review of linear and nonlinear feedback control laws is included. A method that is computable on a microprocessor and assures closed loop stability is explained and compared to a linear control law model. M.A.C.

N84-24479*# Howard Univ., Washington, D. C. Dept. of Mathematics.
MATHEMATICAL ANALYSIS
James A. Donaldson *In its* NASA/Howard Univ. Large Space Structures Inst. 22 Mar. 1984 p 69-76 refs (For primary document see N84-24476 14-80)
Avail: NTIS HC A12/MF A01 CSCL 05I

Simple continuum models used in the design, analysis, and control of large space structures are examined. Particular emphasis is placed on boundary value problems associated with the Load Correction Method and control problems involving partial differential equations for the large space structure models. Partial differential equations will be used to model a large space structure, base the design of an optimal controller on this model, approximate the resulting optimal control model, and compare the results with data from other methods. M.A.C.

N84-24480*# Howard Univ., Washington, D. C. Dept. of Mechanical Engineering.
OPTIMIZATION OF SPACE STRUCTURES
Robert Reiss, S. Ramachandran, and Bo Quian *In its* NASA/Howard Univ. Large Space Structures Inst. 22 Mar. 1984 p 77-96 refs (For primary document see N84-24476 14-80)
Avail: NTIS HC A12/MF A01 CSCL 05I

Computational methods for the design of structures for specified transient response, truss beam units with specified attached vibration absorbers, and laminates for structural components of large space structures are examined. Equations for the measurement of structural stiffness that are maximized for a specific total mass and that will reduce the structural weight are presented. A model for a cantilevered space truss beam of a specific mass and with a specified tip vibration absorber is explained. Design criteria of the laminates include minimizing the weight as well as frequency, buckling, and global stiffness constraints. Other variables include orientation of the lamina and the thickness of each layer. M.A.C.

N84-24481*# Howard Univ., Washington, D. C.
DYNAMICS AND CONTROL OF FLEXIBLE ORBITING SYSTEMS
Peter M. Bainum, K. Pande, R. Krishna, A. S. Sivaramachandran, and S. Ananthakrishnan *In its* NASA/Howard Univ. Large Space Structures Inst. 22 Mar. 1984 p 97-134 refs (For primary document see N84-24476 14-80)
Avail: NTIS HC A12/MF A01 CSCL 05I

Mathematical modeling and design analysis is carried out for large flexible spacecraft and antenna systems. Modeling topics include inertially fixed attitude stabilization, solar radiation pressure effects, control systems for space mast structures, and optimal control of a hoop/column space antenna system. Each subject includes a brief overview of the pertinent literature and details of the proposed solutions for the specific modeling tasks. M.A.C.

N84-24482*# Howard Univ., Washington, D. C. Dept. of Mechanical Engineering.
MICROPROCESSOR BASED IMPLEMENTATION OF ATTITUDE AND SHAPE CONTROL OF LARGE SPACE STRUCTURES
A. S. S. R. Reddy *In its* NASA/Howard Univ. Large Space Structures Inst. 22 Mar. 1984 p 138-146 refs (For primary document see N84-24476 14-80)
Avail: NTIS HC A12/MF A01 CSCL 05I

The feasibility of off the shelf eight bit and 16 bit microprocessors to implement linear state variable feedback control laws and assessing the real time response to spacecraft dynamics is studied. The complexity of the dynamic model is described along with the appropriate software. An experimental setup of a beam, microprocessor system for implementing the control laws and the needed generalized software to implement any state variable feedback control system is included. M.A.C.

N84-24483# Southeastern Center for Electrical Engineering Education, Inc., St. Cloud, Fla.
THE UNITED STATES AIR FORCE GRADUATE STUDENT SUMMER SUPPORT PROGRAM, 1983. MANAGEMENT REPORT Final Report
W. D. Peele, E. L. Steele, and A. L. Otis Oct. 1983 110 p (Contract F49620-82-C-0035; AF Proj. 2301)
(AD-A139363; AFOSR-84-0151TR) Avail: NTIS HC A06/MF A01 CSCL 05/9

A pilot program for Graduate Student Summer Support via the Air Force Office of Scientific Research Summer Faculty Research Program (SFRP) was initiated by contract modification on 26 March 1982. The program was developed as an adjunct effort to the SFRP. Its purpose is to provide funds for selected graduate students to work at an appropriate Air Force Laboratory or Center with a supervising professor who holds a concurrent SFRP appointment. SCEEE appointed 17 graduate students representing fifteen (15) schools and ten (10) disciplines in science and engineering in the 1982 program. In 1983 the Program was expanded to 53 students representing 36 schools and 18 disciplines. The 53 participants were selected from 117 applicants. To be eligible, all candidates had to be currently registered in a graduate program. The graduate students were selected from the fields of engineering, computer science, mathematics, or the physical sciences and were supervised by a faculty member who held an appointment as a SCEEE Fellow for the summer of 1983 under the Summer Faculty Research Program. The students were U.S. citizens, working toward an appropriate graduate degree, and currently enrolled in the graduate school at their respective institutions. Author (GRA)

N84-24484# Southeastern Center for Electrical Engineering Education, Inc., St. Cloud, Fla.
UNITED STATES AIR FORCE SUMMER FACULTY RESEARCH PROGRAM, 1983. PROGRAM MANAGEMENT REPORT Final Report
W. D. Peele, E. L. Steele, and A. L. Otis Dec. 1983 179 p (Contract F49620-82-C-0035; AF Proj. 2301)
(AD-A139366; AFOSR-84-0153TR) Avail: NTIS HC A09/MF A01 CSCL 05/1

The program provides opportunities for research in the physical sciences, engineering, life sciences, business, and administrative sciences. The program has been effective in providing basic research opportunities to the faculty of universities, colleges, and technical institutions throughout the United States. The program is available to faculty members in all academic grades: instructor, assistant professor, associate professor, professor, department chairman, and research facility directors. It has proven especially beneficial to young faculty members who are starting their academic research programs and to senior faculty members who have spent time in university administration and are desirous of returning to scholarly research programs. Beginning with the 1982 program, research opportunities were provided for 17 graduate students. The 1982 pilot student program was judged highly successful and was expanded for the 1983 program to 53 students. GRA

N84-24485# Southeastern Center for Electrical Engineering Education, Inc., St. Cloud, Fla.
UNITED STATES AIR FORCE SUMMER FACULTY RESEARCH

PROGRAM, 1983, VOLUME 1 Final Report
W. D. Peele, E. L. Steele, and A. L. Otis Dec. 1983 251 p 2 Vol.
(Contract F49620-82-C-0035; AF Proj. 2301)
(AD-A139403; AFOSR-84-0154TR) Avail: NTIS HC A12/MF A01 CSCL 05/1

The United States Air Force Summer Faculty Research program (USAF-SFRP) is a program designed to introduce university, college, and technical institute faculty members to Air Force research. This is accomplished by the faculty members being selected on a nationally advertised competitive basis for a ten-week assignment during the summer intersession period to perform research at Air Force laboratories/centers. Each assignment is in a subject area and at an Air Force facility mutually agreed upon by the faculty members and the Air Force. In addition to compensation, travel and cost of living allowances are also paid. The USAF-SFRP is sponsored by the Air Force Office of Scientific Research, Air Force Systems Command, United States Air Force, and is conducted by the Southeastern Center for Electrical Engineering. Author (GRA)

N84-24486# Southeastern Center for Electrical Engineering Education, Inc., St. Cloud, Fla.
UNITED STATES AIR FORCE SUMMER FACULTY RESEARCH PROGRAM, 1983, VOLUME 2 Final Report
W. D. Peele, E. L. Steele, and A. L. Otis Dec. 1983 159 p 2 Vol.
(Contract F49620-82-C-0035; AF Proj. 2301)
(AD-A139404; AFOSR-84-0155TR) Avail: NTIS HC A08/MF A01 CSCL 05/1

The United States Air Force Summer Faculty Research program (USAF-SFRP) is a program designed to introduce university, college, and technical institute faculty members to Air Force research. This is accomplished by the faculty members being selected on a nationally advertised competitive basis for a ten-week assignment during the summer intersession period to perform research at Air Force laboratories/centers. Each assignment is in a subject area and at an Air Force facility mutually agreed upon by the faculty members and the Air Force. In addition to compensation, travel and cost of living allowances are also paid. The USAF-SFRP is sponsored by the Air Force Office of Scientific Research, Air Force Systems Command, United States Air Force, and is conducted by the Southeastern Center for Electrical Engineering. Author (GRA)

N84-24487# Air Force Systems Command, Wright-Patterson AFB, Ohio. FOREIGN TECHNOLOGY DIV.
SCIENTOLOGY AND MANAGEMENT OF SCIENCE AND TECHNOLOGY
D. G. Qian and W. S. Min 14 Feb. 1984 33 p Transl. into ENGLISH from Kexuexue Xu Kexue Jishu Guanli (China), No. 5, 1981 p 39-41, 42-44
(AD-A139084; FTD-ID(RS)T-0006-84) Avail: NTIS HC A03/MF A01 CSCL 05/1

Current structures for supporting scientific and technical research in China are now reviewed as well as their historical development. Changes required to switch the national economy from emphasis on heavy industry to the production of consumer goods are discussed. The ratio of research to support personnel is examined with particular attention given to the chemical engineering sector. A.R.H.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N84-24488# Office of the Deputy Under Secretary of Defense for Research and Development (Research and Advanced Technology), Washington, D.C.
THE DEPARTMENT OF DEFENSE STATEMENT ON THE SCIENCE AND TECHNOLOGY PROGRAM BY DR. EDITH W. MARTIN, DEPUTY UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ADVANCED TECHNOLOGY BEFORE THE SUBCOMMITTEE ON RESEARCH AND DEVELOPMENT OF THE COMMITTEE ON ARMED SERVICES OF THE UNITED STATES HOUSE OF REPRESENTATIVES, 98TH CONGRESS, SECOND SESSION
E. W. Martin 21 Mar. 1984 48 p
(AD-A139402) Avail: NTIS HC A03/MF A01 CSCL 05/1

This report discusses the following selected major FY 1985 Programs: Organization for Computer and Micro-Electronics R&D; DoD-University Interface; Science and Technology Role in Export Control; University Instrumentation Program; Independent Research and Development (IR&D); Small Business Innovation Development Program; In-House Laboratories; Software Initiatives; Very High Speed Integrated Circuits; Research; Materials and Structures; Aircraft Propulsion Technology; Advanced Aircraft Technology; Chemical Warfare; Medical and Life Sciences; Electronic Warfare; Search and Surveillance; Missile Propulsion, Training and Personnel Systems Technology; Munitions Technology; Geophysics and Global Meteorological Oceanographic Support; and The DoD Scientific and Technical Information Program. GRA

N84-24489# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
DATA ENVELOPMENT ANALYSIS AND EXTENSIONS FOR DECISION SUPPORT AND MANAGEMENT PLANNING Ph.D. Thesis
C. T. Clark May 1983 214 p
(AD-A139430; AFIT/CI/NR-83-94D) Avail: NTIS HC A10/MF A01 CSCL 05/1

The public expects military efficiency from the combat forces it supports with tax dollars. The United States Air Force needs integrative measures of efficiency and needs decision support systems which aid in detecting inefficiencies, diagnosing problems, and choosing among alternative courses of action to improve the efficiency and effectiveness of combat units. The Data Envelopment Analysis (DEA) technique developed by Charnes, Cooper and Rhodes provided the basic theoretical starting point for this dissertation. It anables the unified analysis of multiple technical, economic and effectiveness measures in contrast to past reliance by Air Force Management on partial measures of productivity, cost effectiveness, etc. Theory was extended by this study to provide analytical capabilities suitable for use by the Air Force in the analysis and interpretation of efficiency and in the preparation of management plans. This dissertation provided a basic theoretical framework for future development of decision support prototypes suitable for use by the Air Force in managing military effectiveness and efficiency. GRA

N84-24490# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va.
AN OVERVIEW OF PRODUCTIVITY IMPROVEMENT EFFORTS IN ARMY ORGANIZATIONS
L. W. Oliver and P. V. Rijn Feb. 1984 26 p
(DA Proj. 2Q2-63743-A-794)
(AD-A138589; ARI-RN-84-55) Avail: NTIS HC A03/MF A01 CSCL 05/1

This paper presents an overview of the types of productivity improvement efforts being conducted in the Army. The activities of the formal Army programs, which are associated with comptroller offices, typically reflect the traditional industrial engineer approach stressing efficiency with relatively little emphasis on behavioral science concerns. An exception is the Productivity Enhancement, Measurement and Evaluation (EEMI) program which includes projects such as quality circles that are based on behavioral science principles and techniques. The activities of the Army's Organizational Effectiveness (OE) program do not usually make productivity improvement their principal focus, although productivity indicators may be used to evaluate OE operations. Examples are presented of Army productivity improvement projects based on behavioral science approaches. These include gainsharing, quality circles, and organizational interventions founded on sociotechnical systems theory. Problems encountered in the measurement of

productivity are discussed, and a pilot study to develop and test measures of scientist/engineer productivity is also described. GRA

N84-24491# Illinois Univ., Urbana-Champaign. School of Architecture.
MODELS OF PURPOSIVE HUMAN ORGANIZATION: A COMPARATIVE STUDY Final Report, 1 Jun. 1981 - 30 Sep. 1982
E. L. Murphree, Jr., R. M. Dinnat, N. Carreon, M. W. Harless, and B. W. Elliott Alexandria, Va. Army Research Institute for the Behavioral and Social Sciences Feb. 1984 50 p
(Contract MDA903-81-M-4220; DA Proj. 2Q2-63743-A-794)
(AD-A138871; RN-84-64) Avail: NTIS HC A03/MF A01 CSCL 05/1

The authors have previously presented a framework for a generic model of purposive human organization, based on relationships between pairs of resources, pairs of tasks, and resource-task pairs. This study compares the relational model, on the bases of conceptual foundations, function, and operation, with the socio-technical model. In addition to the theoretical comparison, a detailed example of a hypothetical organization is presented. GRA

N84-24492# Office of Naval Research, London (England).
SCIENCE IN THE EUROPEAN ECONOMIC COMMUNITY: A SELF-ASSESSMENT AND A DETAILED PLAN OF ACTION
J. W. Daniel 27 Jan. 1984 117 p
(AD-A139078; ONR-R-2-84) Avail: NTIS HC A06/MF A01 CSCL 05/1

This report summarizes the European Economic Community's (EEC's) new scientific policy, provides the EEC Commission's assessment of the community's international position in science policy, and presents the detailed scientific and technological goals of a program for coordinating and planning future policy. GRA

N84-24493# Texas A&M Univ., College Station. Dept. of Management.
THE NATURE AND USE OF FORMAL CONTROL SYSTEMS FOR MANAGEMENT CONTROL AND STRATEGY IMPLEMENTATION
R. L. Daft and N. B. MacIntosh Feb. 1984 63 p
(Contract N00014-83-C-0025)
(AD-A139083; TR-ONR-DG-06) Avail: NTIS HC A04/MF A01 CSCL 05/1

Management control research from organization theory, accounting and business policy is reviewed, and a two-stage qualitative study of management control systems (MCS's) is reported. The study identified four MCS components-budget, policies and procedures, performance appraisal system, and statistical reports--that were used at the middle management level in business organizations. Each MCS component played a role during the control cycle of target setting, monitoring, and corrective feedback. The findings were used to propose two models - one model links the MCS to business-level strategy implementation, and the other model defines primary and secondary roles for MCS components in the management control process. Author (GRA)

N84-24494# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
THE MBB BUSINESS ACTIVITIES' REPORT Annual Report, 1982 [KONZERN-GESCHAEFTSBEREICH, 1982]
1982 44 p In GERMAN
Avail: NTIS HC A03/MF A01

The activities of MBB in 1982 are reviewed. Personnel and organizational questions are discussed. A commercial balance is presented. The activities in the different domains are reviewed: apparatus, rotors and traffic, aircraft, marine and special techniques, astronautics, transport and transport aircraft. Author (ESA)

N84-24495# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Raumfahrt.
PROFITABILITY IMPROVEMENT OF PROJECTS BY EARLY CONSIDERATION OF LIFE CYCLE COST REDUCTION [VERBESSERUNG DER WIRTSCHATFLICHKEIT VON PROJEKTEN DURCH FRUEHZEITIGE LEBENSZYKLUSKOSTEN (LZK)-BETRACHTUNG]
Bernd-J. Madauss 16 Feb. 1983 32 p refs Partly in GERMAN and ENGLISH Conf. on Ges. fuer Projektmanagement, Munich, 16 Feb. 1983
(MBB-UR-620-83-O) Avail: NTIS HC A03/MF A01

Life cycle costs, average unit fly away cost, and design to cost are defined. Program costs and program phases in the life cycle costs of a system are presented. The political decision making in the production of public goods is explained. The main milestones in and main activities during life cycle of a system are presented. The parameters influencing life cycle costs are given. Author (ESA)

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N84-24496# RAND Corp., Santa Monica, Calif.
DESIGNING READABLE AND REUSABLE TABLES
Ira S. Lowry Dec. 1983 84 p refs
(RAND/P-6945) Avail: NTIS HC A05/MF A01

A practical guide to designing tables for research reports, books, and professional articles is presented. Expositional purposes and devices for achieving them are stressed. The specific applications of tables or figures are outlined. Exemplary tables are provided in the main text along with 50 sample tabular formats in the appendix. A glossary of tabular terms is included. R.S.F.

N84-24497# Measurement Concept Corp., Rome, N. Y.
I AND W (INDICATIONS AND WARNING) DATA BASE MANAGEMENT SYSTEMS ANALYSIS Final Technical Report, 15 Sep. 1980 - 15 Dec. 1982
Jun. 1983 326 p
(Contract F30602-80-C-0286; AF Proj. 1955)
(AD-A139339; RADC-TR-83-136) Avail: NTIS HC A15/MF A01 CSCL 05/2

The objective of this effort was to identify the data base management system that seems to best support the Indications and Warning analyst using a given hardware and operating system configuration. Hardware and operating system constraints were to utilize a Digital Equipment Corporation PDP 11/70 computer running the IAS operating system. This configuration is the DOD standard intelligence support processor. A precise description of an Indications and Warning data base was developed from scenarios constructed by observing analysis at DIA, SAC, MAC, and ADCOM. The description was then used to construct a simulated data base. Scripts were developed from each scenario to generate activity against the data base. Software was developed to allow execution of repeatable tests, each with psuedo-randomly variable conditions. Important developments of this effort included; the precise characterization of an I and W Data Base, the DHIL language, used to describe the scenarios and the data base, the set of analyst scenarios which accurately describe the functions and activities of intelligence analysts, and a hardware/software configuration usable for evaluating the performance of data base management hardware and software in the future. Author (GRA)

N84-24498# Control Data Corp., Minneapolis, Minn.
ADVANCED DOCUMENT RETRIEVAL SYSTEM Final Technical Report, Sep. 1979 - Apr. 1983
W. Cyre, J. Vaughan, and S. Adkins Griffiss AFB, N.Y. RADC Jul. 1983 266 p
(Contract F30602-79-C-0231; AF Proj. 6244)
(AD-A139385; RADC-TR-83-168) Avail: NTIS HC A12/MF A01 CSCL 09/2

This work is related to a previous study, in which the intelligence

retrieval application and data bases at FTD were analyzed; potential usefulness of reconfigurable arrays and associative memories was assessed; and an exploratory model of an associative unit was designed, fabricated, and evaluated. The work performed under this effort extended the analysis, acquired additional data and developed and demonstrated a full scale advanced document retrieval system. Models were developed for text compression, data base partitioning trade-offs were made, and analysis was performed for automatic data base generation. The work included the design and fabrication of a full scale associative processing unit (AU) with 1000 MOPS processing capability and 256K-bit storage capacity. This was interfaced to an array of three existing Advanced Flexible Processors (AFP), a host computer, and a secondary mass storage system. This equipment configuration served as the hardware basis for the document retrieval demonstration. GRA

N84-24499# Institute for Image Processing Computer Mapping, Graz (Austria).
EXPERIMENTS TO CORRECT A DIGITAL MAP DATA BASE USING SCENE ANALYSIS Progress Report, 1 Sep. - 31 Dec. 1983
F. Leberl Mar. 1984 39 p
(Contract DAJA45-83-C-0022; DA Proj. IT1-61102-BH-57)
(AD-A139447; PR-4) Avail: NTIS HC A03/MF A01 CSCL 09/2

Concepts and methods used in correcting a digital map base with scene analysis are presented in summary form. This study is concerned with one special aspect of computer vision: How can knowledge in the form of a digital map serve in automatic image interpretation, and, on the other hand, how can interpretation results be used to change or update the map? In a wider sense, map may mean any graphic representation of a scene that is imaged. Here, in particular, this document deals with maps in the cartographic sense, and with images from airborne photographic systems. One of the obvious applications is the correction or densification of a map data base using time series of aerial surveying imagery. The aim of this study therefore is the design of a strategy to evaluate the usefulness of image-map correspondence to aid the interpretation of digital aerial photography. This is the first step to be taken towards a photo-interpretation expert system, which shall be called henceforth name PHIX. GRA

N84-24500# National Science Foundation, Washington, D.C.
REPORT OF THE INFORMATION TECHNOLOGY WORKSHOP
Robert F. Cotelessa Oct. 1983 164 p Workshop held in Leesburg, Vir., 5-7 Jan. 1983
(PB84-163203; NSF/CPE-83010) Avail: NTIS HC A08/MF A01 CSCL 05B

The six topics addressed at the workshop are summarized: (1) artificial intelligence; (2) distributed computing and networking; (3) highly parallel computing; (4) information science; (5) research in support of some major use areas; and (6) robotics. The severe shortage of research manpower that currently exists in universities is emphasized, and the need for a major government industry university effort to deal with this problem is cited. It is noted that there is a paucity of large scale computer systems in universities; the access to such systems is limited, and research programs are hindered. It is said to be in the national interest to develop the knowledge base for the construction, support, and coordination of large-scale systems to be used as test beds for research and shared by researchers. GRA

N84-24501# Southwest Texas State Univ., San Marcos.
PROJECT FIRST (FACULTY INFORMATION AND RESEARCH SERVICE FOR TEXAS) TECHNICAL DESCRIPTION OF PROJECT AND RESULTS
S. Groggan 1983 9 p
(Grant NSF ISP-79-16510)
(PB84-161629; NSF/ISP-83025) Avail: NTIS HC A02/MF A01 CSCL 05B

The background and objectives of the Faculty Information and Research Service for Texas (FIRST) are presented. The FIRST network consists of campus liaisons located at participating institutions of higher education in Texas. This network functions as an inquiry/response system designed to provide legislators with information quickly, in a readily usable format, and upon request. FIRST is composed of an advisory committee, a director, and an assistant. GRA

N84-24502# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
AGARD INDEX OF PUBLICATIONS, 1980-1982
Jan. 1984 412 p
(ISBN-92-835-1462-9) Avail: NTIS HC A18/MF A01

Full bibliographic citations and abstracts for AGARD documents published in the 1980-1982 period are given. Entries are arranged under the major subject divisions and specific categories used by NASA in its abstract journals and bibliographies. Within each category, the abstracts are arranged by series and year. Subject (based on NASA Thesaurus nomenclature), personal author, corporate source, report accession number, and accession number indexes are included. A.R.H.

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N84-24503# Committee on Commerce, Science, and Transportation (U. S. Senate).
TRANSFER OF CIVIL METEOROLOGICAL SATELLITES
Washington GPO 1983 3 p Rept. to accompany S. 67 presented to the Comm. on Com., Sci. and Technol. 98th Congr., 1st Sess., 26 Sep. 1983
(S-Rept-98-260; GPO-11-010) Copyright. Avail: US Capitol, Senate Document Room

The primary objective of this resolution is to curtail present efforts by the administration to all the Government's civil meteorological satellite (METSAT) systems by sending a definite signal that the Congress does not believe such a transfer is timely. Author

N84-24504# Committee on Small Business (U. S. House).
PAPERWORK REDUCTION ACT OF 1980
Washington GPO 1984 160 p Hearing before the Subcomm. on Govt. Regulation and Paperwork of the Comm. on Small Business, 98th Congr., 1st Sess., 15 Nov. 1983
(S-Rept-98-479; GPO-28-416) Avail: Subcommittee on Government Regulation and Paperwork

How Government paperwork requirements are affecting America's small businesses is examined with emphasis on the effectiveness of the 1980 Paperwork Reduction Act, Public Law 96-511. Some specific recommendations as to how the paperwork burden can be further reduced are advanced. A.R.H.

N84-24505# Office of Technology Assessment, Washington, D.C.
WORKSHOP ON ARMS CONTROL IN SPACE
1984 66 p Workshop held in Washington, D.C., 30-31 Jan. 1984
(LC-84-601064) Avail: SOD HC

A workshop focusing on antisatellite (ASAT) weapons as one aspect of space arms control was held and provided an opportunity for technical, diplomatic, military, and policy analysis experts to interact. The workshop was organized into six sessions. The first session, reviewed technical aspects of anti-satellite systems. The

second session covered pros and cons of ASAT arms control. Soviet attitudes and efforts regarding ASATs were the focus of the third session; U.S. attitudes and developments in ASATs and ASAT arms control were reviewed in the fourth. The effect of ASATs on the continued viability of the 1972 Anti Ballistic Missile (ABM) Treaty, and vice versa, were covered in the fifth session. The last session centered on verification issues. M.A.C.

N84-24506# Committee on Commerce, Science, and Transportation (U. S. Senate).
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AUTHORIZATION BILL, 1984
Washington GPO 1984 41 p A bill, H.R. 5154, referred to the Comm. on Com., Sci. and Transportation, 98th Congr., 2d Sess., 14 May 1984
(S-Rept-98-455) Avail: US Capitol, Senate Document Room

The advanced communication technology satellite, space commercialization, space station development, and the design of a single rotation or counter rotation turboprop are among the NASA research and development programs funded. Appropriations for other research and development activities are itemized as well as those for space flight, control, and data communication; construction, modification, and repairs to facilities; and program management. The National Commission on Space Act comprises Title 2 of the legislation. A.R.H.

N84-24507# Committee on Commerce, Science, and Transportation (U. S. Senate).
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AUTHORIZATION ACT
Washington GPO 1984 69 p Rept. to accompany H. R. 5154 presented by the Comm. on Com., Sci., and Transportation, 98th Congr., 2nd Sess., 17 May 1984
(S-Rept-98-455; GPO-31-010) Avail: US Capitol, Senate Document Room

Committee adjustments to NASA's request for fiscal year 1985 are elaborated and summarized. The appropriations authorized total $7,582,400,00. A.R.H.

N84-24508# Committee on Appropriations (U. S. House).
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT APPROPRIATIONS BILL, 1984
Washington GPO 1984 49 p H.R. 5713 enacted into law by 98th Congr., 2d Sess., 23 May 1984
(H-Rept-98-803) Avail: U.S. Capitol, House Document Room

Appropriations for the Department of Housing and Urban Development, NASA, and for sundry independent agencies, boards, commissions, corporations, and offices for the fiscal year ending September 30, 1985 are enumerated. Specific NASA programs receiving funds include: space station development, the gamma ray observatory, spaceborne telescopes, upper stage rocket engines, the Venus orbiting imaging radar spacecraft, and the Galileo project. Other programs receiving monies were urban research, solar energy, environmental protection, medical research, and science education. R.S.F.

N84-23553# Joint Publications Research Service, Arlington, Va.
LEGAL EXPERT EXPOUNDS ON NEW CIVIL AIR CODE
N. Vasilyev *In its* USSR Rept.: Transportation (JPRS-UTR-84-004) 24 Feb. 1984 p 6-11 Transl. into ENGLISH from Grazhdanskaya Aviats. (Moscow), no. 10, Oct. 1983 p 18-19 (For primary document see N84-23551 14-01)
Avail: NTIS HC A04/MF A01

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N84-24509*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPARISON OF FREE-PISTON STIRLING ENGINE MODEL PREDICTIONS WITH RE1000 ENGINE TEST DATA
Roy C. Tew 1984 21 p refs Proposed for presentation at the 19th Intersoc. Energy Conversion Eng. Conf., San Francisco, 19-24 Aug. 1984; sponsored by American Nuclear Society, ASME, SAE, IEEE, AIAA, ACS, and AIChE
(Contract DE-AI05-82OR-1005)
(NASA-TM-83650; E-2095; DOE/NASA/1005-3; NAS 1.15:83650) Avail: NTIS HC A02/MF A01 CSCL 13F

Predictions of a free-piston Stirling engine model are compared with RE1000 engine test data taken at NASA-Lewis Research Center. The model validation and the engine testing are being done under a joint interagency agreement between the Department of Energy's Oak Ridge National Laboratory and NASA-Lewis. A kinematic code developed at Lewis was upgraded to permit simulation of free-piston engine performance; it was further upgraded and modified at Lewis and is currently being validated. The model predicts engine performance by numerical integration of equations for each control volume in the working space. Piston motions are determined by numerical integration of the force balance on each piston or can be specified as Fourier series. In addition, the model Fourier analyzes the various piston forces to permit the construction of phasor force diagrams. The paper compares predicted and experimental values of power and efficiency and shows phasor force diagrams for the RE1000 engine displacer and piston. Further development plans for the model are also discussed. Author

N84-24510# Argonne National Lab., Ill. Chemical Technology Div.
TESTING AND EVALUATION OF EV-1300 LEAD-ACID MODULES FOR THE HYBRID VEHICLE APPLICATION
E. C. Gay, D. O. Corp (Tellabs, Inc.), E. R. Hayes (Abbott Labs.), C. E. Webster, F. Horstra, and N. P. Yao 1984 7 p refs Presented at the Intern. SAE Congr. and Exposition, Detroit, 27 Feb. 1984
(Contract W-31-109-eng-38)
(DE84-006718; CONF-840253-2) Avail: NTIS HC A02/MF A01

Tests of two 6-cell, EV-1300 modules with a capacity of 105 Ah (1235 Wh) were conducted at the computer-automated National Battery Test Laboratory at Argonne National Laboratory to verify the above design requirements. In addition, the following tests were completed to more fully characterize the performance of the battery: (1) capacity measurements over a range of constant-current discharges of 35 to 400 A (peukert Plot); (2) energy measurements over a range of constant-power discharges of 10 to 100 W/kg (Ragone Plot); (3) open-circuit stand testing (self-discharge); (4) partial DOD testing (memory effect); (5) projected range based on simulated driving profile discharges representing the EPA urban driving schedule negotiated by the HTV-1 hybrid vehicle with minimum ICE operation; (6) projected range based on simulated driving profile discharges representing the SAE J227aD urban driving schedule negotiated by an improved ETV-1 (an all-electric vehicle); and (7) peak power measurements at various depths of discharge. DOE

N84-24511# Department of Energy, Washington, D. C. Office of Vehicle and Engine Research and Development.
ELECTRIC AND HYBRID VEHICLES PROGRAM. REPORT TO CONGRESS FOR FISCAL YEAR 1983 Annual Report
Feb. 1984 23 p

(DE84-007792; DOE/CS-50101/1; AR-7) Avail: NTIS HC A02/MF A01

The manufacturing and supply of electric and hybrid vehicles is discussed. Research and development in batteries and propulsion components and as total vehicle systems, are progressing and provide industry with technology options that will result in vehicles that are more economically competitive and more acceptable to the public. Vehicles currently in use by site operators are improved with advanced technology and tested to assess their ability to reliably and economically accomplish practical work functions. DOE

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N84-24512*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AN X-RAY SURVEY OF VARIABLE RADIO BRIGHT QUASARS
M. J. Henriksen, F. E. Marshall, and R. F. Mushotzky Apr. 1984 28 p refs Submitted for publication
(NASA-TM-86094; NAS 1.15:86094) Avail: NTIS HC A03/MF A01 CSCL 03A

A sample consisting primarily of radio bright quasars was observed in X-rays with the Einstein Observatory for times ranging from 1500 to 5000 seconds. Detected sources had luminosities ranging from 0.2 to 41.0 x 10 to the 45th power ergs/sec in the 0.5 to 4.5 keV band. Three of the fourteen objects which were reobserved showed flux increases greater than a factor of two on a time scale greater than six months. No variability was detected during the individual observations. The optical and X-ray luminosities are correlated, which suggests a common origin. However, the relationship (L sub x is approximately L sub op to the (.89 + or - .15)) found for historic radio variables may be significantly different than that reported for other radio bright sources. Some of the observed X-ray fluxes were substantially below the predicted self-Compton flux, assuming incoherent synchrotron emission and using VLBI results to constrain the size of the emission region, which suggests relativistic expansion in these sources. Normal CIV emission in two of the sources with an overpredicted Compton component suggests that although they, like BL Lac objects, have highly relativistic material apparently moving at small angle to the line of sight, they have a smaller fraction of the continuum component in the beam. Author

N84-24513# Michigan Univ., Ann Arbor. Dept. of Physics.
THE DETECTION OF FAINT SPACE OBJECTS USING SOLID STATE IMAGING DETECTORS Annual Technical Report, 1 Jan. - 31 Dec. 1983
D. J. Hegyi 31 Dec. 1983 22 p
(Grant AF-AFOSR-0095-80; AF Proj. 2311)
(AD-A139297; AFOSR-84-0159TR) Avail: NTIS HC A02/MF A01 CSCL 03/1

Speckle interferometry has been carried out during the last year with a charge-coupled device (CCD) imaging system. The emphasis of this project has been to minimize all systematic differences that arise between the images of stars in a binary star system and a reference calibration star in order to resolve a previously unresolved binary star system. Systematic errors have been minimized to the level of parts in 10,000 in the power spectrum of a stellar image. This was accomplished by using a 64x64 pixel area near the readout amplifier to minimize charge smearing, by stabilizing our CCD system to the level of a few parts in 100,000, and by using a prism system to compensate for atmospheric dispersion. Author (GRA)

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

No abstracts in this category.

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

N84-24514*# National Aeronautics and Space Administration, Washington, D. C.
PRELIMINARY STUDY OF MICROTEKTITES FIRST DISCOVERED IN THE CENTRAL PACIFIC BY CHINA
P. Hanchang, Y. Shong, M. Xi, and S. Shijie Mar. 1984 18 p refs Transl. into ENGLISH from Acta Oceanologica Sinica (China), v. 5, no. 2, Mar. 1983 8 p Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77470; NAS 1.15:77470) Avail: NTIS HC A02/MF A01 CSCL 03B

Electron probe analysis was used to determine the chemical composition of microtektites discovered in the Central Pacific. An X-ray energy spectrum analysis was made, and the surface microstructure was investigated. The found microtektites appear to be younger than the microtektites reported in the Asia Australia Strewn Field. Author

N84-24515# Joint Publications Research Service, Arlington, Va.
USSR REPORT. LIFE SCIENCES: BIOMEDICAL AND BEHAVIORAL SCIENCES
13 Apr. 1984 87 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UBB-84-007) Avail: NTIS HC A05/MF A01

A wide variety of topics concerning medicine, agriculture, the life sciences, food technology, human factors engineering, laser technology, and pharmacology are examined. Subjects include aerospace medicine, plant protection, technology forecasting, biochemistry, biophysics, ecology, epidemiology, genetics, immunology, microbiology, toxicology, public health, and veterinary medicine. For individual titles, see N84-24516 through N84-24518.

N84-24516# Joint Publications Research Service, Arlington, Va.
URACIL AND URIDINE PHOTOLYSIS ON LUNAR SOIL Abstract Only
Ye. A. Kuzicheva and L. V. Smagina *In its* USSR Rept.: Life Sci.: Biomed. and Behavioral Sci. (JPRS-UBB-84-007) 13 Apr. 1983 p 1 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (USSR), v. 273, no. 2, Nov. 1983 p 501-505 (For primary document see N84-24515 14-91)
Avail: NTIS HC A05/MF A01

Studies were conducted on the degree of photolysis of uracil and uridine adsorbed on lunar soil under the influence of ultraviolet light in maximum doses of 27,000 joules per square meter. Comparison adsorbance studies for base photolysis were conducted on various metal oxides. Irradiation under nitrogen led to decomposition of 79% of the uracil sample and 30% of the uridine sample adsorbed to lunar soil. Ultraviolet mediated photolysis

maybe responsible for the lack of organic matter on the lunar surface. M.A.C.

N84-24517# Joint Publications Research Service, Arlington, Va.
CONTRIBUTIONS OF SPACE MEDICINE TO MEDICAL RESEARCH Abstract Only c52
O. G. Gazenko, I. P. Neumyvakin, Ye. A. Kovalenko, R. M. Bayevskiy, and B. B. Yegorov *In its* USSR Rept.: Life Sci.: Biomed. and Behavioral Sci. (JPRS-UBB-84-007) 13 Apr. 1983 p 1-2 Transl. into ENGLISH from Zdorovye (USSR), no. 4, Apr. 1983 p 10-11 (For primary document see N84-24515 14-91)
Avail: NTIS HC A05/MF A01

Recent advances in space medicine and related medical research applications are presented. The effects of weightlessness on human metal and physical performance as well as physiochemistry are discussed. Technology transfer of spaceborne montoring and electrophoresis to general medical use is described. M.A.C.

N84-24518# Joint Publications Research Service, Arlington, Va.
EFFECTS OF LUNAR SOIL AND METAL OXIDES ON THERMAL AND RADIOCHEMICAL STABILITY OF AMINO ACIDS Abstract Only
M. A. Khenokh and Ye. M. Lapinskaya *In its* USSR Rept.: Life Sci.: Biomed. and Behavioral Sci. (JPRS-UBB-84-007) 13 Apr. 1983 p 2 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (USSR), v. 272, no. 6, Oct. 1983 p 1502-1505 Original language document was announced as A84-14879 (For primary document see N84-24515 14-91)
Avail: NTIS HC A05/MF A01

The paper examines results of laboratory experiments concerning the effect of lunar soil and a number of metal oxides (Al2O3, SiO2, CaO, and TiO2) characteristic for highland and mare basalts on the thermal and radiative-chemical stability of amino acids. The results suggest that the fact that only a very small quantity of amino acids has been found in lunar soil can be explained by their decomposition under the combined effect of various forms of radiation, solar wind, and abrupt temperature change. In addition, the data indicate that certain minerals composing the regolith have a considerable effect on the stability of amino acids with respect to heat and ionizing radiation. B.J.

N84-23955# Geological Survey, Washington, D. C.
THE USE OF SATELLITE TECHNOLOGY IN THE SEARCH FOR METEORITES IN ANTARCTICA AUT 01MEUNIER, TONY K. Abstract Only
In its US Geological Survey Polar Res. Symp. 1983 p 19-20 (For primary document see N84-23934 14-42)
Avail: NTIS HC A04/MF A01; also available from SOD

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N84-24519*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ENERGETIC ELECTRONS IN IMPULSIVE SOLAR FLARES
David Allen Batchelor May 1984 175 p refs
(Grant NGT-34-003-801)
(NASA-TM-86102; NAS 1.15:86102) Avail: NTIS HC A08/MF A01 CSCL 03B

A new analysis was made of a thermal flare model proposed by Brown, Melrose, and Spicer (1979) and Smith and Lilliequist (1979). They assumed the source of impulsive hard X-rays to be a plasma at a temperature of order 10 to the 8th power K, initially located at the apex of a coronal arch, and confined by ion-acoustic turbulence in a collisionless conduction front. Such a source would expand at approximately the ion-sound speed, C sub S = square root of (k T sub e/m sub i), until it filled the arch. Brown, Melrose, and Spicer and Smith and Brown (1980) argued that the source assumed in this model would not explain the simultaneous impulsive microwave emission. In contrast, the new results presented herein suggest that this model leads to the development of a quasi-Maxwellian distribution of electrons that explains both the hard X-ray and microwave emissions. This implies that the source sizes can be determined from observations of the optically-thick portions of microwave spectra and the temperatures obtained from associated hard X-ray observations. In this model, the burst emission would rise to a maximum in a time, t sub r, approximately equal to L/c sub s, where L is the half-length of the arch. New observations of these impulsive flare emissions were analyzed herein to test this prediction of the model. Observations made with the Solar Maximum Mission spacecraft and the Bern Radio Observatory are in good agreement with the model. R.S.F.

N84-24520*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A COMPARATIVE LOOK AT SUNSPOT CYCLES
Robert M. Wilson May 1984 177 p refs
(NASA-TP-2325; NAS 1.60:2325) Avail: NTIS HC A09/MF A01 CSCL 03B

On the basis of cycles 8 through 20, spanning about 143 years, observations of sunspot number, smoothed sunspot number, and their temporal properties were used to compute means, standard deviations, ranges, and frequency of occurrence histograms for a number of sunspot cycle parameters. The resultant schematic sunspot cycle was contrasted with the mean sunspot cycle, obtained by averaging smoothed sunspot number as a function of time, tying all cycles (8 through 20) to their minimum occurence date. A relatively good approximation of the time variation of smoothed sunspot number for a given cycle is possible if sunspot cycles are regarded in terms of being either HIGH- or LOW-R(MAX) cycles or LONG- or SHORT-PERIOD cycles, especially the latter. Linear regression analyses were performed comparing late cycle parameters with early cycle parameters and solar cycle number. The early occurring cycle parameters can be used to estimate later occurring cycle parameters with relatively good success, based on cycle 21 as an example. The sunspot cycle record clearly shows that the trend for both R(MIN) and R(MAX) was toward decreasing value between cycles 8 through 14 and toward increasing value between cycles 14 through 20. Linear regression equations were also obtained for several measures of solar activity. A.R.H.

N84-24521# Air Force Geophysics Lab., Hanscom AFB, Mass.
A CATALOG OF SOLAR WHITE-LIGHT FLARES, INCLUDING THEIR STATISTICAL PROPERTIES AND ASSOCIATED EMISSIONS, 1859 - 1982
D. F. Neidig and E. W. Cliver 20 Sep. 1983 54 p
(AF Proj. 2311)
(AD-A138645; AFGL-TR-83-0257; AFGL-ERP-856) Avail: NTIS HC A04/MF A01 CSCL 03/2

This catalog of 57 solar white-light flares reported between 1859 and 1982 includes H-alpha, soft X-ray, and radio emissions associated with the white-light flares. The following are among the conclusions resulting from statistical examination of the listed flares and the active regions in which they occurred: (1) The active regions that produce white-light flares tend to have the following characteristics: (a) magnetic class = Delta; (b) classification of the penumbra of the largest spot = K; and (c) sunspot group area > 500 millionths of the solar hemisphere. (2) Northern Hemisphere white-light flare activity begins abruptly about 1 or 2 years before solar maximum, and declines slowly thereafter. Southern hemisphere white-light flare activity follows the same pattern, but begins approximately 1 year after solar maximum. (3) White light flares have a mean latitude of 13 + or - 2 deg in the Southern Hemisphere but a mean latitude of 18 + or - 1 deg in the Northern Hemisphere. (4) White-light flares exhibit a north-south asymmetry with 70% more events having been observed in the Northern Hemisphere as compared to the southern (the current solar cycle is a possible exception with southern hemisphere activity dominating) as of December 1982. (5) There is no compelling evidence of preferred solar longitudes for white-light flare active regions. Southern Hemisphere activity during the current cycle is a possible exception. GRA

N84-24522*# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
THERMAL AND NONTHERMAL PHENOMENA IN SOLAR FLARE LOOPS AT 20 cm WAVELENGTH AND IN X-RAYS
E. J. Schmahl, M. R. Kundu, P. B. Landecker, and D. L. McKenzie 15 Dec. 1983 31 p Prepared in cooperation with Maryland Univ.
(Grant NGR-21-002-199; Contract F04701-83-C-0084; Grant NSF ATM-81-03089)
(NASA-CR-173429; NAS 1.26:173429; AD-A138912; TR-0084(4940-01)-2; SD-TR-83-95) Avail: NTIS HC A03/MF A01 CSCL 03/2

We present X-ray images from the P78-1 satellite for a long-lasting burst at 20-cm wavelength mapped with the Very Large Array on 19 May 1979 by Velusamy and Kundu (1981). The decimeter wave observations were originally interpreted in terms of two models, one invoking thermal electrons radiating at low harmonics of the gyrofrequency, and the other invoking mildly relativistic electrons emitting gyrosynchrotron radiation. If indeed the 20 cm source is thermal, it should also be visible in soft X rays while if it is nonthermal, the soft X-ray emission should be weak or spatially or temporally distinct from the 20 cm burst. We find that only one of the three 20 cm sources was approximately co-spatial with the soft X-ray source, and that is was only partially thermal. The 20 cm burst is therefore primarily decimeter type IV emission from mildly relativistic electrons of the post-flare phase. The long lifetime (or approx 2 hr) and smooth temporal variation of the burst belie its nonthermal nature and suggest continuous accierations as well as long term storage of energetic electrons.
Author (GRA)

N84-24523# National Geophysical Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 471, NOVEMBER 1983. PART 1: (PROMPT REPORTS). DATA FOR OCTOBER 1983, SEPTEMBER 1983 AND LATE DATA
Nov. 1983 112 p refs
(PB84-156991; SGD-471-Pt-1; NOAA-84020703-Pt-1) Avail: NTIS HC A06/MF A01 CSCL 03B

Topics covered include the following: IUWDS ALERT PERIODS (Advance and Worldwide); solar activity indices; solar flares; solar radio emission; Boulder geomagnetic substorm log; inferred interplanetary magnetic field polarity; mean solar magnetic field; solar active regions; sudden ionospheric disturbances; cosmic ray measurements by neutron monitor; geomagnetic indices and radio propagation indices. GRA

N84-24524# National Geophysical Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 471, NOVEMBER 1983. PART 2: COMPREHENSIVE REPORTS. DATA FOR MAY 1983 AND MISCELLANEA
Helen E. Coffey, ed. Nov. 1983 60 p refs
(PB84-157007; SGD-471-Pt-2; NOAA-84020704-Pt-2) Avail: NTIS HC A04/MF A01 CSCL 03B

Topics covered include the following: solar radio bursts at fixed frequencies; solar X-ray radiation from GOES 2; and mass ejections from the Sun. GRA

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N84-24525# California Univ., Berkeley. Lawrence Berkeley Lab.
MEASUREMENT OF THE INTENSITY OF THE COSMIC BACKGROUND RADIATION AT 3.0 cm Ph.D. Thesis
Scott David Friedman Jan. 1984 136 p refs
(Contract DE-AC03-76SF-00098; Grants NSF PHY-80-15694; NSF AST-83-02843)
(DE84-008246; LBL-17279) Avail: NTIS HC A07/MF A01

The intensity of the cosmic background radiation (CBR) was measured at a wavelength of 3.0 cm as part of a program to measure the Rayleigh-Jeans spectrum of the CBR at five wavelengths between 0.33 cm and 12 cm. The instrument used is a dual antenna Dicke switched radiometer with a double sideband noise temperature of 490 K and a sensitivity of 46 mK/Hz 1/2. The entire radiometer is mounted on bearings. The atmospheric emission was measured by rotating the radiometer, and thus directing one antenna to zenith angles of + or - 30 deg and + or - 40 deg. DOE

99 GENERAL

N84-24526# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
CALENDAR OF AGARD TECHNICAL MEETINGS 1984
Loughton, England 1984 6 p
Avail: NTIS HC A02/MF A01

The calendar of technical meetings for the Advisory Group for Aerospace Research and Development (AGARD) is presented. Conference topics include aerospace engineering of structures and materials, propulsion system configurations, aerospace medicine, guidance and flight control, avionics, and fluid dynamics. The dates and locations of administrative meetings for AGARD are included.
M.A.C.

N84-24527# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
AGARD BULLETIN: MEETINGS, PUBLICATIONS, MEMBERSHIP
Jan. 1984 77 p
(AGARD-Bul-84/1) Avail: NTIS HC A05/MF A01

A summary of technical meetings and themes, publications, and membership is presented. Conference and publication topics include: aerospace medicine, avionics, electromagnetic wave propagation, flight mechanics, fluid dynamics, flight guidance and control, propulsion and energetics, structures and materials, and technical information dissemination. The 76 publications listed include an abstract. R.S.F.

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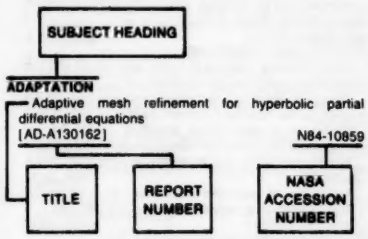
Typical Subject Index Listing



The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7051).

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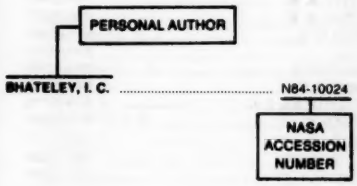

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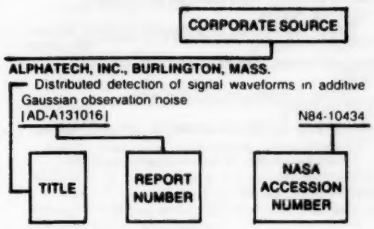

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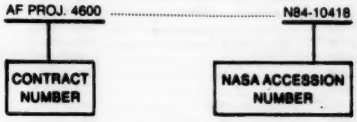

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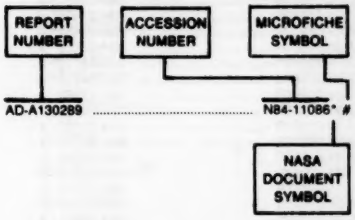

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